

NEVADA STATE BOARD
of
DENTAL EXAMINERS

LASER WORKING GROUP/
LEGISLATIVE & DENTAL
PRACTICE (RESOURCE GROUP)

MARCH 22, 2012

6:00 p.m.

***NO PUBLIC MATERIALS FOR
THIS MEETING***

Diode Perio Laser Training

William H. Chen,
DMD, MAGD, MWICD, MALD, FACD, FICD

Perio Disease

A National Epidemic

- Affects 75%-80% of the adult population
- Over 40% have attachment loss > 3mm

Major Health Risks Linked to Gum Disease

- ◎ Heart Disease
- ◎ Stroke
- ◎ Diabetes
- ◎ Respiratory Disease
- ◎ Osteoporosis
- ◎ Low Birth Weight

- ◎ “This evidence suggests a moderate association, but not a casual relationship between periodontal disease and heart disease. Animal studies suggest that infection with *P. gingivalis* enhances atheroma lesion formation.”

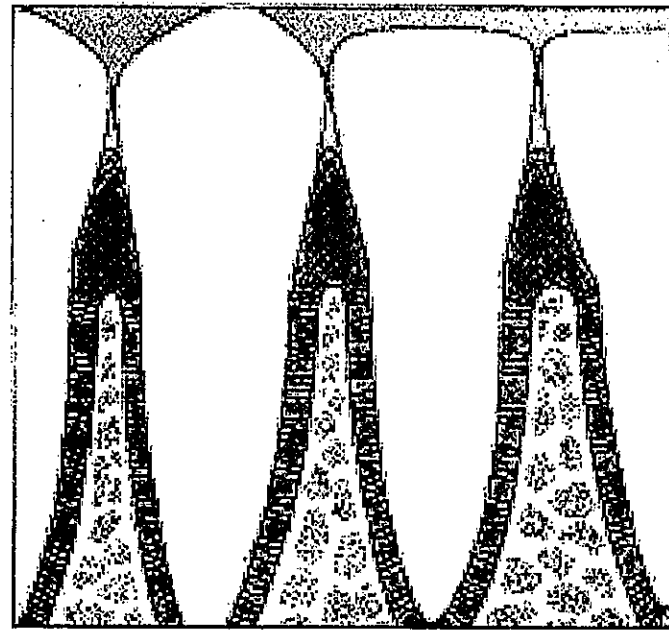
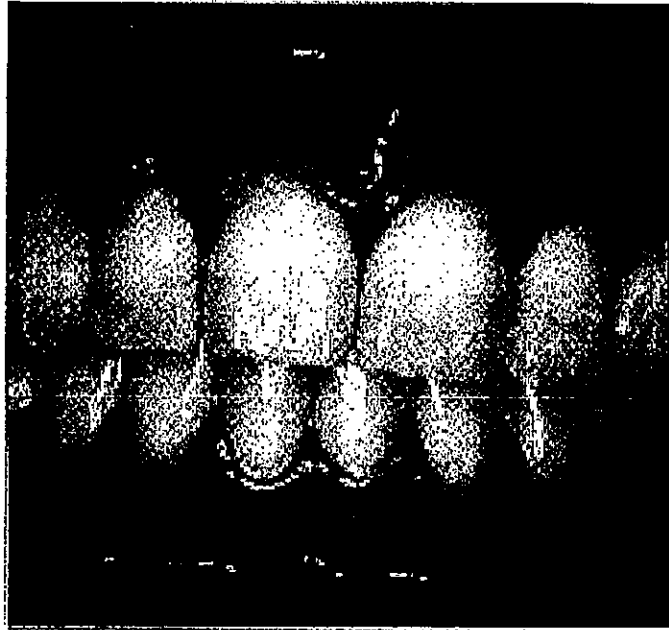
Genco R, Offenbacher S, Beck J. Periodontal disease and cardiovascular disease. JADA 2002 June Supplement. 133(6):14s-22s.

- ◎ “Seven of nine studies evaluating tooth loss and periodontal disease as risk factors for stroke or peripheral vascular disease showed some significant associations.”

Joshipura K. The relationship between oral conditions and ischemic stroke and peripheral vascular disease. JADA 2002 June Supplement. 133(6):23s-30s.

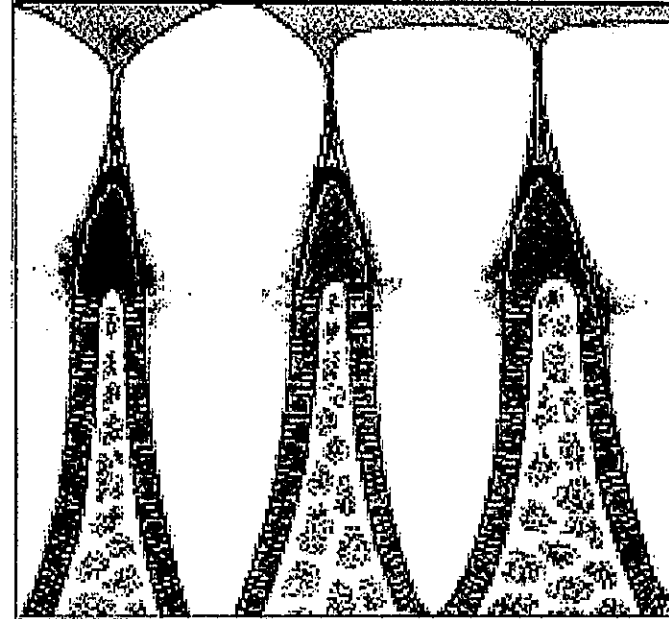
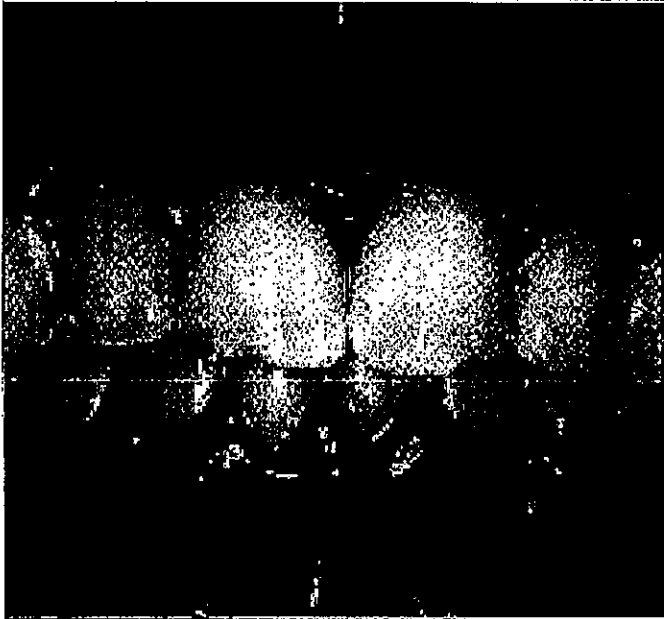
- ◎ “Researchers have found that people with periodontal disease are almost twice as likely to suffer from coronary artery disease as those without periodontal disease.”

Progress of Periodontal Disease



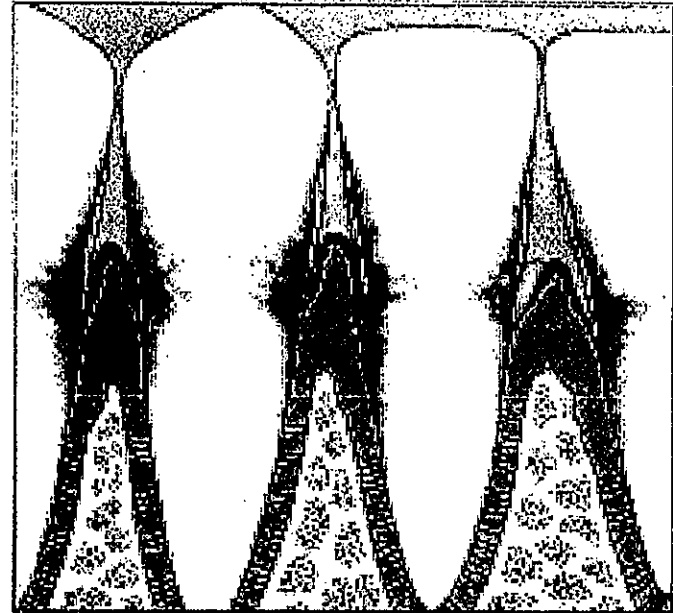
Stage 1: Healthy gingiva and bone anchor teeth firmly in place.

Progress of Periodontal Disease



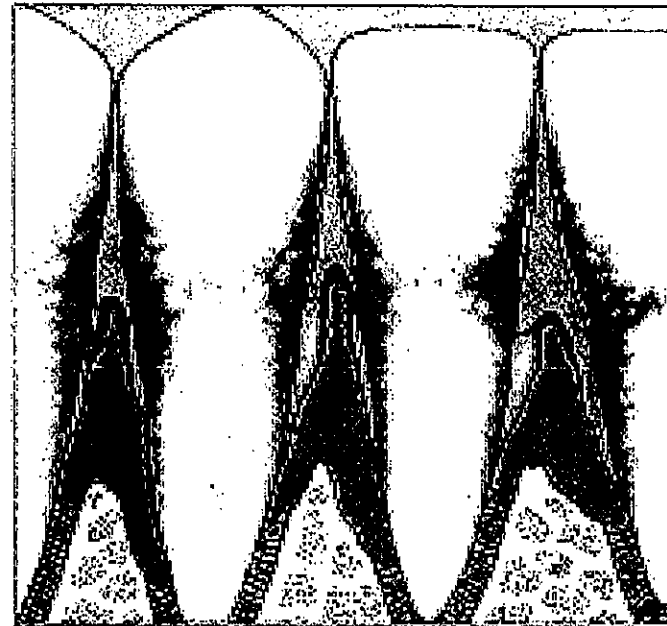
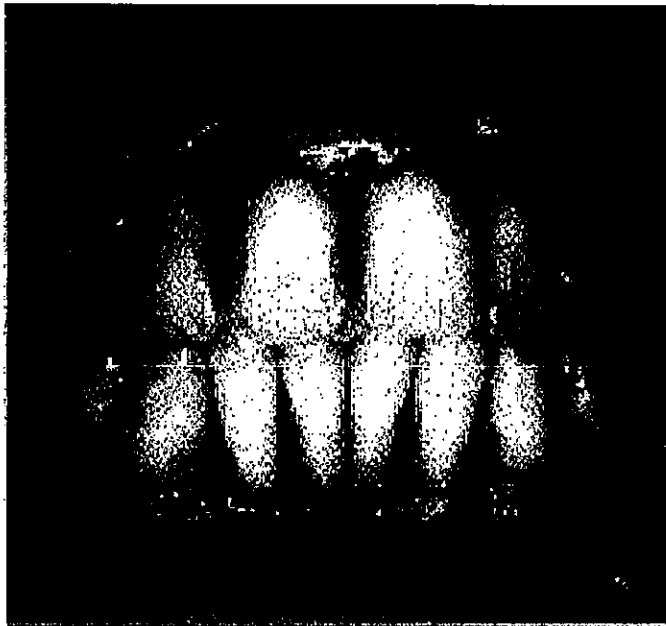
Stage 2: Gingivitis develops as toxins in plaque irritate the gums.

Progress of Periodontal Disease



Stage 3: Moderate periodontitis occurs when toxins destroy the connective tissues: collagen, elastin & hyaluronic acid. Early bone loss.

Progress of Periodontal Disease



Stage 4: Advanced Periodontitis occurs with advancing destruction of connective tissues and alveolar bone.

The Benefits of the Diode Laser

- ◎ Laser incisions seal lymphatic vessels and nerve endings, which results in:
 - Less inflammation
 - Less swelling
 - Less pain

Laser Benefits

- ◎ Improves visibility.
- ◎ Can be used with topical anesthetics.
- ◎ Fewer shots translates into better treatment acceptance from patients. Patients with less anxiety have lower blood pressure (which lowers yours).
- ◎ Minimally invasive laser procedures extend the range of periodontal therapy that can be completed without an open flap procedure.

Laser Benefits

- ◎ “Every year many patients with advanced periodontal disease lose their teeth because both the dentist and the patient dread treatment. Patients frequently have stories of friends and relatives that went through a painful ordeal and a seemingly never ending recovery with periodontal surgery. To add insult to injury, they frequently need retreatment in 3 to 5 years”.

- Dr. Brett Dyer

Functions of a Diode Laser

- ◎ You can trough around the root and actually see what you are cleaning.
- ◎ You can remove the lining epithelium for reattachment.
- ◎ You can clean the root surface and leave a more biocompatible root surface than with any other instrument.
- ◎ You can enhance new bone growth.

EzLase Versus Electrosurgery

- ◎ Can use Ezlase around metal
- ◎ Has zone of necrosis 3-5 cells deep
- ◎ Perio Applications
- ◎ Whitens Teeth
- ◎ Desensitizes Teeth
- ◎ Herpetic and Aphthous Ulcer Treatment
- ◎ Marketing Benefits

Soft Tissue Indications

- ◎ Hemostasis
- ◎ Crown Troughing
- ◎ Sulcular Debridement
- ◎ Gingivectomy/Gingivoplasty
- ◎ Frenectomy/Frenotomy
- ◎ Implant Recovery

- ◎ The objective of using a diode laser as an adjunct to scaling and root planing is to improve the efficacy of root planing, decontaminate the periodontal pocket, and reduce dentin hypersensitivity. By removing the epithelial lining, we promote reattachment.
- ◎ The diode laser has been shown to be safe in the periodontal pocket with up to 2 watts of power. Root surfaces instrumented with hand instruments and diode laser *in vivo* did not show detectable surface alterations. There were no signs of thermal side effects in any of the teeth treated.

- ◎ An 810nm diode laser used at 400 – 1200 mW eliminated *Prevotella* sp, *Streptococcus* betahemolitico, *fusobacterium* sp, and *Pseudomonas* sp. Moritz et al. have demonstrated the elimination of AA with a diode.
- ◎ Diode lasers can remove biofilms

C Fontana, C Kurachi, et al. Microbial reduction in periodontal pockets under exposition of a medium power diode laser: An experimental study in rats. *LasersSurg.Med* 35:263-268;2004.

Biofilm

- ◎ The term “biofilm” describes a community of bacteria enclosed within their own mucinous, gel-like polymer secretions. In the oral cavity, biofilms are responsible for periodontal and peri-implant disease. In periodontal disease, the biofilm complex that is attached to the dental root and pocket epithelium protects pathogenic bacteria from exogenous assault (e.g., from antibiotics) and endogenous attack from the host’s inflammatory and immune responses.

- ◎ Diode laser can be used to eliminate the biofilm by utilizing the inherent thermal properties. 1% methylene blue is used to stain the biofilm. It is used as a heat sink to achieve THERMOLYSIS and COAGULATION of the biofilm, which is changed from a mucinous liquid-gel to a semisolid coagulum. This coagulum can be easily removed from the affected pocket with scaling and root planing.

Laser Assisted Reattachment With the Diode Laser

- Indications – 4 to 6 mm suprabony pockets in healthy patients.
- Patients with diabetes, taking blood thinners, in questionable health, or choose not to have laser assisted regeneration – 4+ mm pocket depth. What is the difference between reattachment and regeneration?
- Always begin treatment by recording pocket depth, gingival margin, BOP, mobility, and depth of furcation. FMX and blood pressure are required.

Should we scale and root plane
before laser treatment
or as a part of the laser treatment?

- ◎ Using the laser to trough around the teeth in sites with 4+ mm of pocket depth allows better visibility of the root and less bleeding.

Practical Considerations

- ◎ If your hygienist does not have the freedom to use a laser, then you can either begin the procedure with de-epithelialization for her or
- ◎ She can complete scaling and root planing. After 1 month, you would reevaluate and then treat the remaining pockets with site specific care.

- ◎ For hygienists that can use the diode laser – use the laser during scaling and root planing as demonstrated next. My hygienist can only use the code 4341. The laser is considered an adjunct to scaling and root planing.
- ◎ Insurance companies do not reimburse more for using the laser as an adjunct.
- ◎ In our office, we explain the benefits of the treatment to the patient and have them pay for the treatment in full. We do charge more than standard 4341 fees. We routinely use Capitol One financing to aid the patient or offer a discount for payment in full at the time of treatment.

Step 1

- ◎ Troughing and wounding of external epithelium.
Watch the tissue disappear under your laser tip.
Must wear magnification.

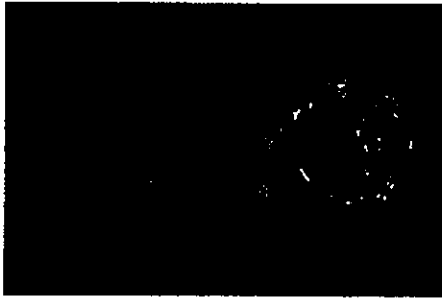
Steps for Laser Assisted Periodontal Therapy with a Diode Laser

- ◎ First we stain the sulcular epithelium. Then I apply a topical anesthetic. Why stain?
- ◎ Diode lasers transform laser energy to radiant energy. So you are working with a “hot tip.” The pocket epithelium is not ablated with the low power achieved with a diode. Rather it is coagulated. The longer you use a diode tip in the periodontal pocket, the more the adjacent tissues are impacted by the heat.
- ◎ Therefore, we use a heat sink. A heat sink can preferentially absorb incandescent heat energy from the diode laser’s hot tip. This approach will protect deeper periodontal tissues from damage and target biofilm in the periodontal pocket for thermolysis.

Diode Periodontal Treatment

- ◎ Listgarten, et al have shown that biofilms and diseased epithelium are highly permeable to methylene blue.
- ◎ The initiated red tip on an activated diode laser emits energy between the spectrum of 600 – 700nm. Which corresponds to the peak absorption of methylene blue.
- ◎ There is a profound energy transfer to the live biofilm and diseased sulcular epithelium that has been stained with MB. This novel targeted and controlled heat transfer results in the formation of a semisolid coagulum (from the biofilm and stained epithelium) that can then easily be removed with root planing and scaling.

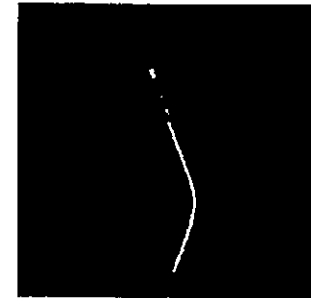
Diode Periodontal Treatment



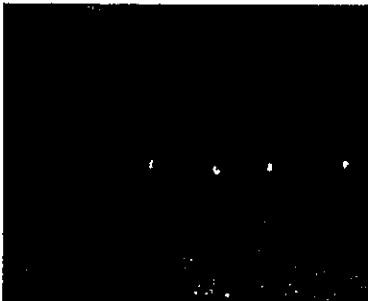
Methylene Blue



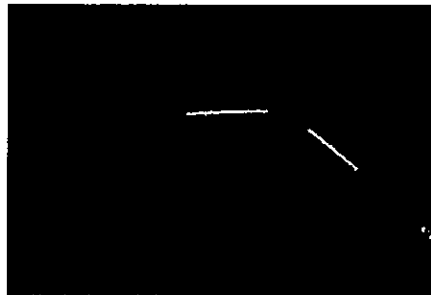
**Methylene Blue
applied with brush**



**Laser activated and
incandescent tip
forms in 1 sec**



**Tip is inserted in
pocket and moved
from side to side
quickly**



**Coagulum is removed.
Roots are planed**



**3 mm healthy sulcus
by 5 weeks**

Diode Periodontal Treatment

- ◎ Listgarten, et al have shown that biofilms and diseased epithelium are highly permeable to methylene blue.
- ◎ The initiated red tip on an activated diode laser emits energy between the spectrum of 600 – 700nm. Which corresponds to the peak absorption of methylene blue.
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Biofilm Removal Settings

- ◎ Peak Power 5.00 Watts
- ◎ Pulse Interval 0.20
- ◎ Pulse Length 0.05
- ◎ Average Power 1.00 Watts
- ◎ 300 um Micron Tip

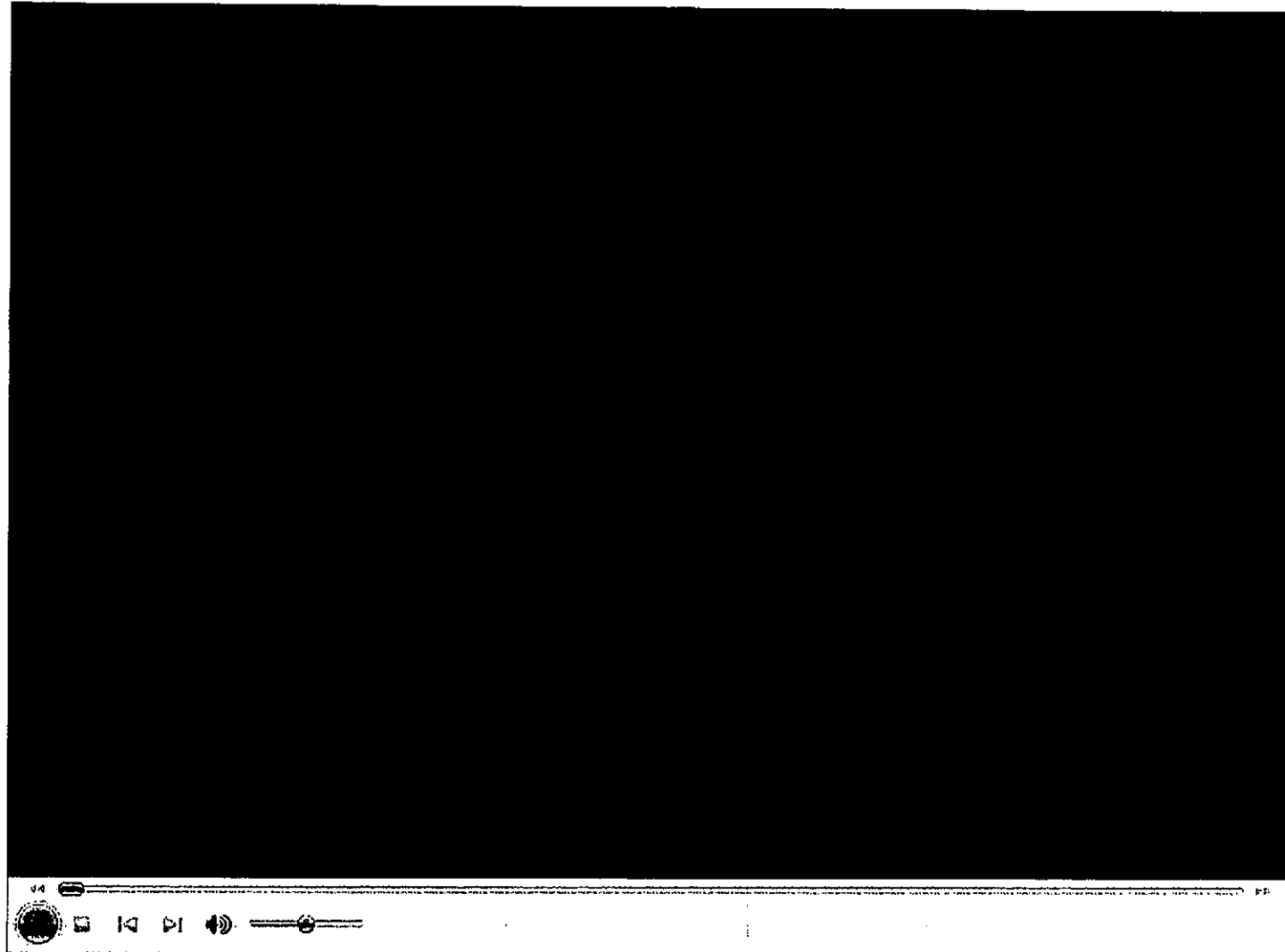
A study published by the *Journal of Periodontal Research* shows that a combined course of Diode laser scaling and root debridement using methylene blue and LLLT treatments are more beneficial than non-laser scaling and root debridement alone for the treatment of chronic periodontitis.

Lui, J., Corbet, E. F., & Jin, L. (2010). Combined photodynamic and low-level laser therapies as an adjunct to nonsurgical treatment of chronic periodontitis. *Journal of Periodontal Research*.



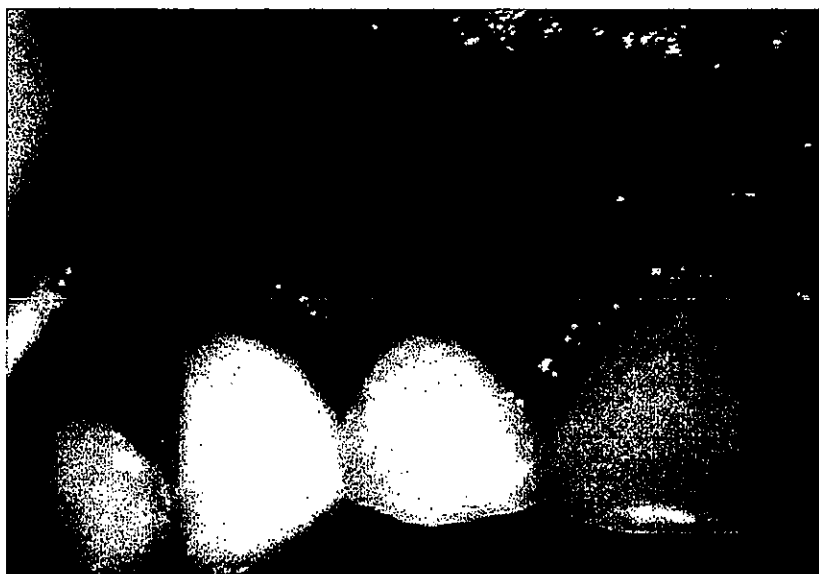
M.B.

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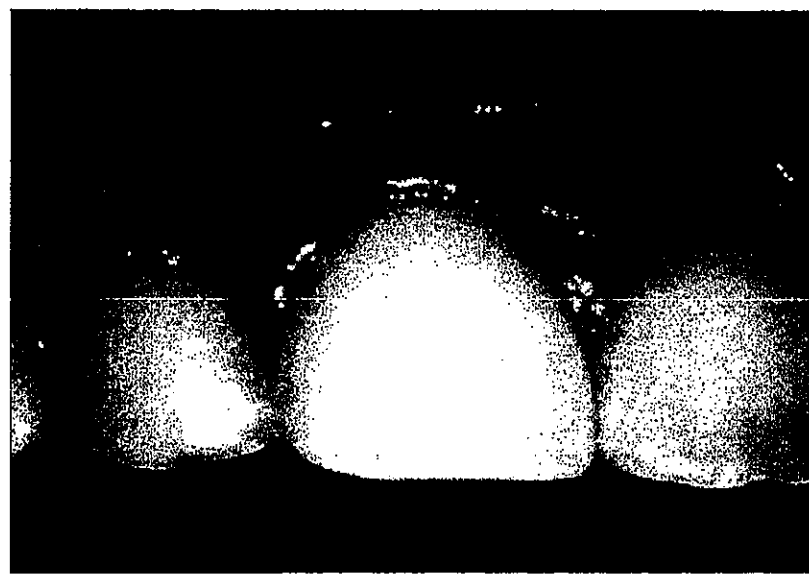


J.C.

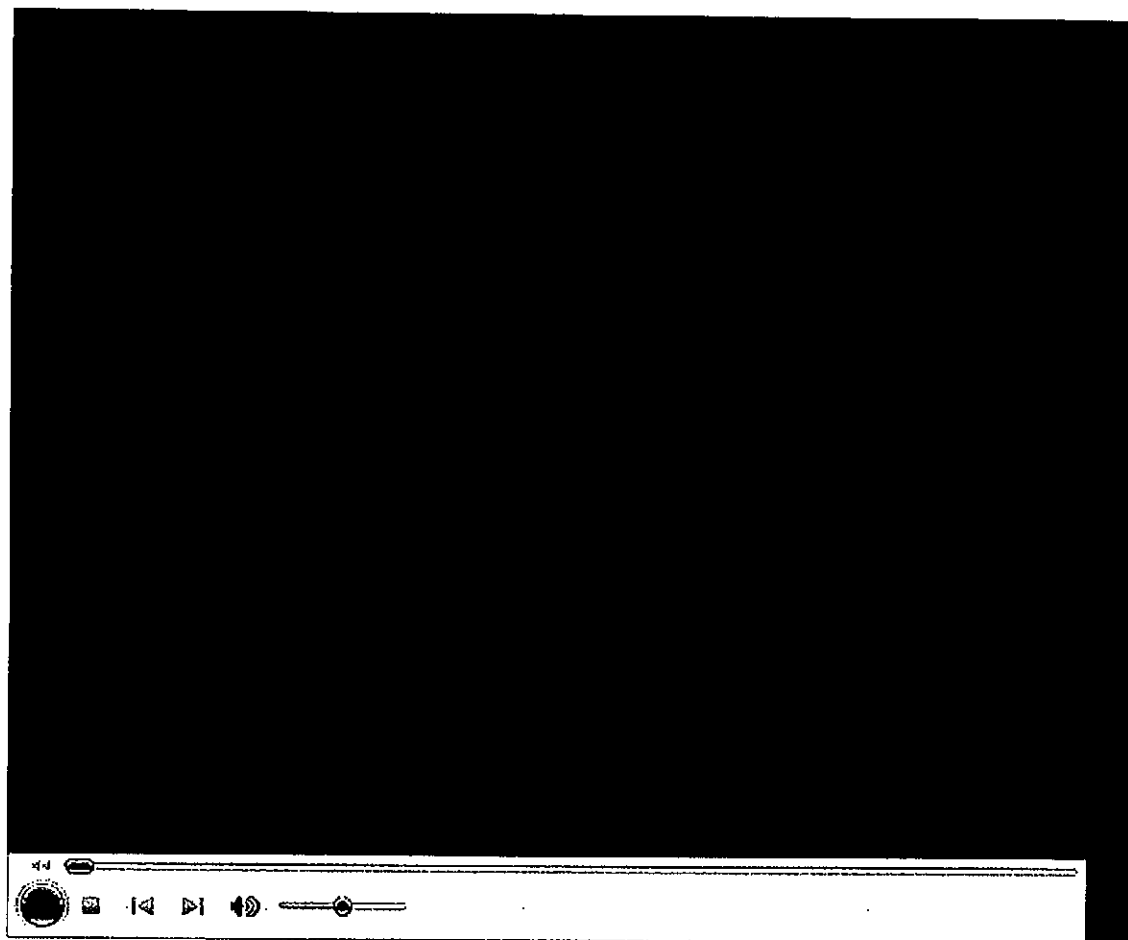
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Pre-op



Post-op



J.D.

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Periodontal Pockets Settings

- ◎ Peak Power 5.00 Watts
- ◎ Pulse Interval 0.20
- ◎ Pulse Length 0.05
- ◎ Average Power 1.00 Watts
- ◎ 300 um Micron Tip

Post Surgery Healing

After the First 12 Hours

- Epithelium Migration: $\frac{1}{2}$ mm per day (after the first 12 hours)
- Fibroblast Migration: 80-100 microns per day
- Osteoblast Migration: 80-100 microns per day

In Other Words

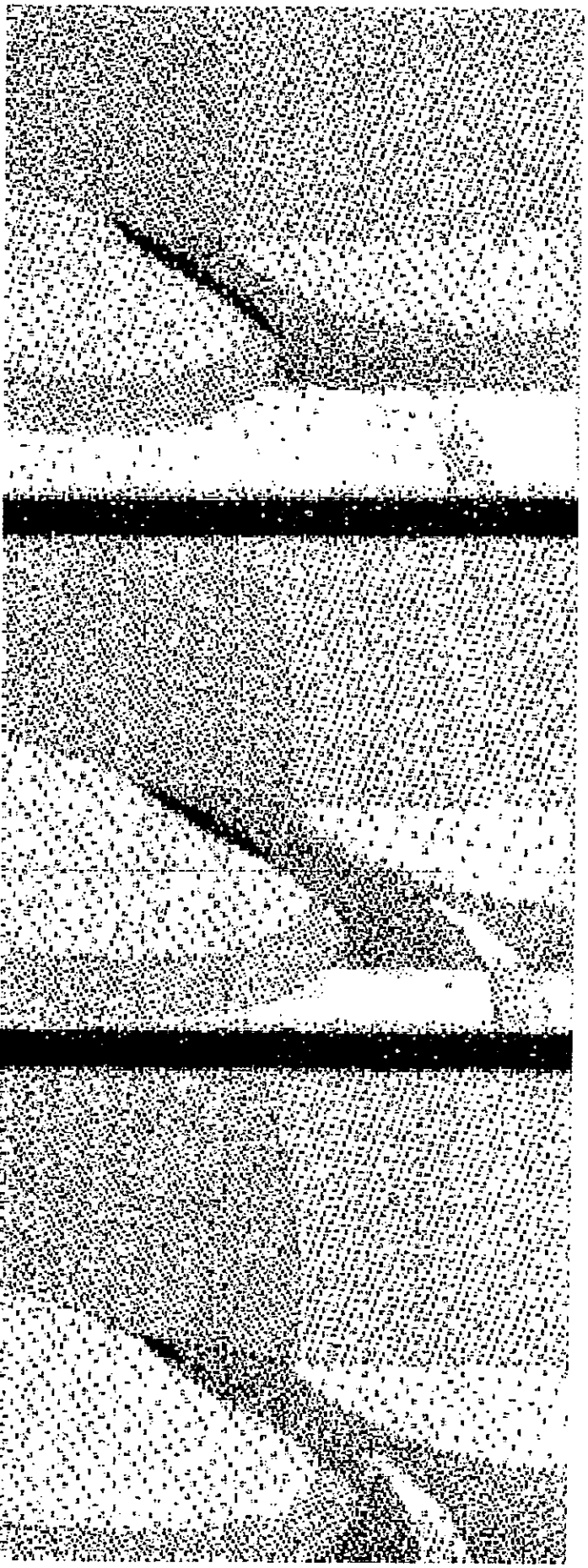
Epithelium grows back 1mm every 2 days.

Fibroblasts and osteoblasts grow 1 mm every 10 days, or so.

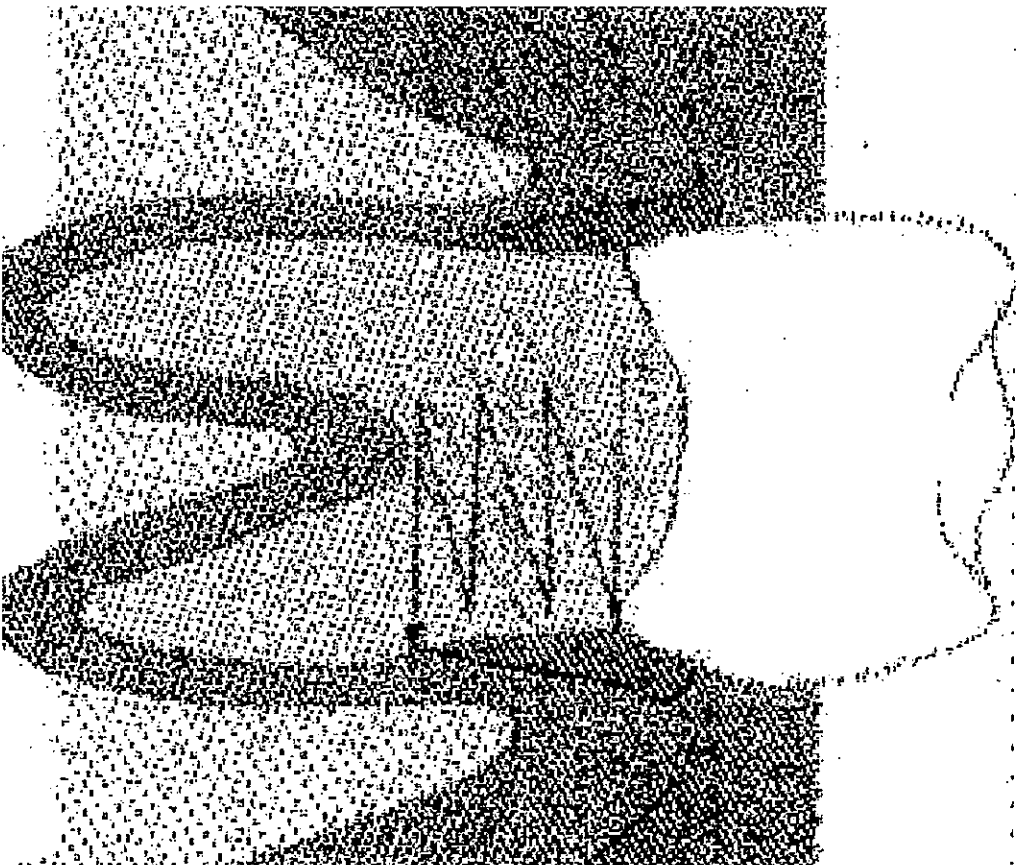
The Purpose of Soft Tissue Management

- ◎ The purpose of a soft tissue program is to restore the periodontal health so that there is:
 - Elimination of the diseased sulcular epithelium
 - Minimal intrasulcular bacterial activity
 - A halting of the apical migration of the epithelial attachment
 - Minimal pocket depth
 - No bleeding upon probing
- ◎ This program is continual

Laser Techniques



- ◎ Insert the fiber in the sulcus keeping parallel and slightly angled towards the diseased epithelium
- ◎ Starting on the crest and working down to the base of the pocket



- ◎ Move the fiber in overlapping horizontal then diagonal direction with fast painting strokes
- ◎ This laser treatment reduces bacterial flora, denatures necrotic tissue and creates a fresh minor wound site

Ezlase Operating Setting

Wavelength: 940 nm

Beam Diameter: 300 Micron Fiber

Perio Pockets – Removal of Diseased and Inflamed Tissue

- -Peak Power: 3.25 Watts
- -Peak Interval: 0.20 ms
- -Pulse Length: 0.05 ms
- -Average Power: 0.66 Watts
- -300 um tip

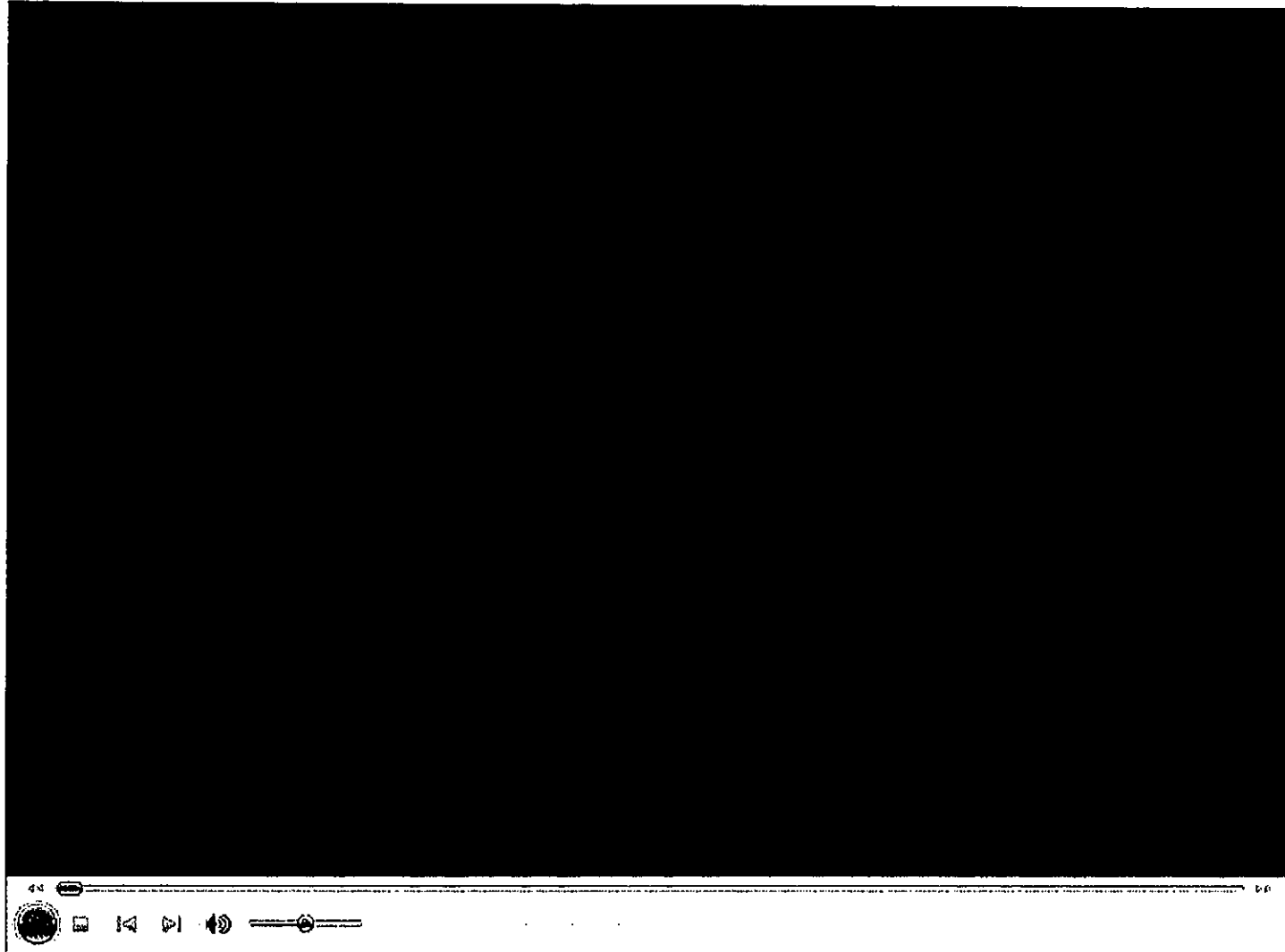
EzLase Operating Setting

Wavelength: 940 nm

Beam Diameter: 300 Micron Fiber

Bacterial Decontamination

- ⦿ -Peak Power: 1.00 Watts
- ⦿ -Continuous Wave Mode
- ⦿ -Average Power: 1.00 Watts
- ⦿ -300 um tip
- ⦿ Uninitiated tip



D.C.

Ezlase Perio Setting

Wavelength: 940 nm

Beam Diameter: 300 Micron Fiber

- ⦿ Initiated
- ⦿ 3.00 Watts
- ⦿ PI = 0.2 m seconds
- ⦿ PL= 0.1 m seconds
- ⦿ Average Power 1.00 Watt

EzLase Perio Setting

Wavelength: 940 nm

Beam Diameter: 300 Micron Fiber

- ◎ Initiated
- ◎ 3.25 Watts
- ◎ PI = 0.2 m seconds
- ◎ PL= 0.1 m seconds
- ◎ Average Power 1.25 Watt

Ezlase Perio Setting

Wavelength: 940 nm

Beam Diameter: 300 Micron Fiber

Perio Pocket Decontamination

- ◎ Uninitiated
- ◎ 3.25 Watts
- ◎ PI = 0.2 m seconds
- ◎ PL= 0.05 m seconds
- ◎ Average Power 0.66 Watts

Twilite Operating Parameter

Wavelength: 810 nm

Beam Diameter: 400 Micron Fiber

Removal of Diseased Epithelial Lining

- -Power: 1.0 – 1.5 Watts – Continuous
- -Pulse Rate: ---- (Continuous)
- -Rep Rate: ---- (Continuous)
- Exposure Time: 20-30 seconds per pocket

Twilite Operating Parameter

Wavelength: 810 nm

Beam Diameter: 400 Micron Fiber

Bacterial Decontamination

- ◎ Power: 1.0 – 2.0 Watts
- ◎ Pulse Rate: 10 pulses per second
- ◎ Rep Rate: .05 seconds
- ◎ Exposure time: 20-30 seconds per pocket

- ◎ Monitor / Adjust to Patient Comfort

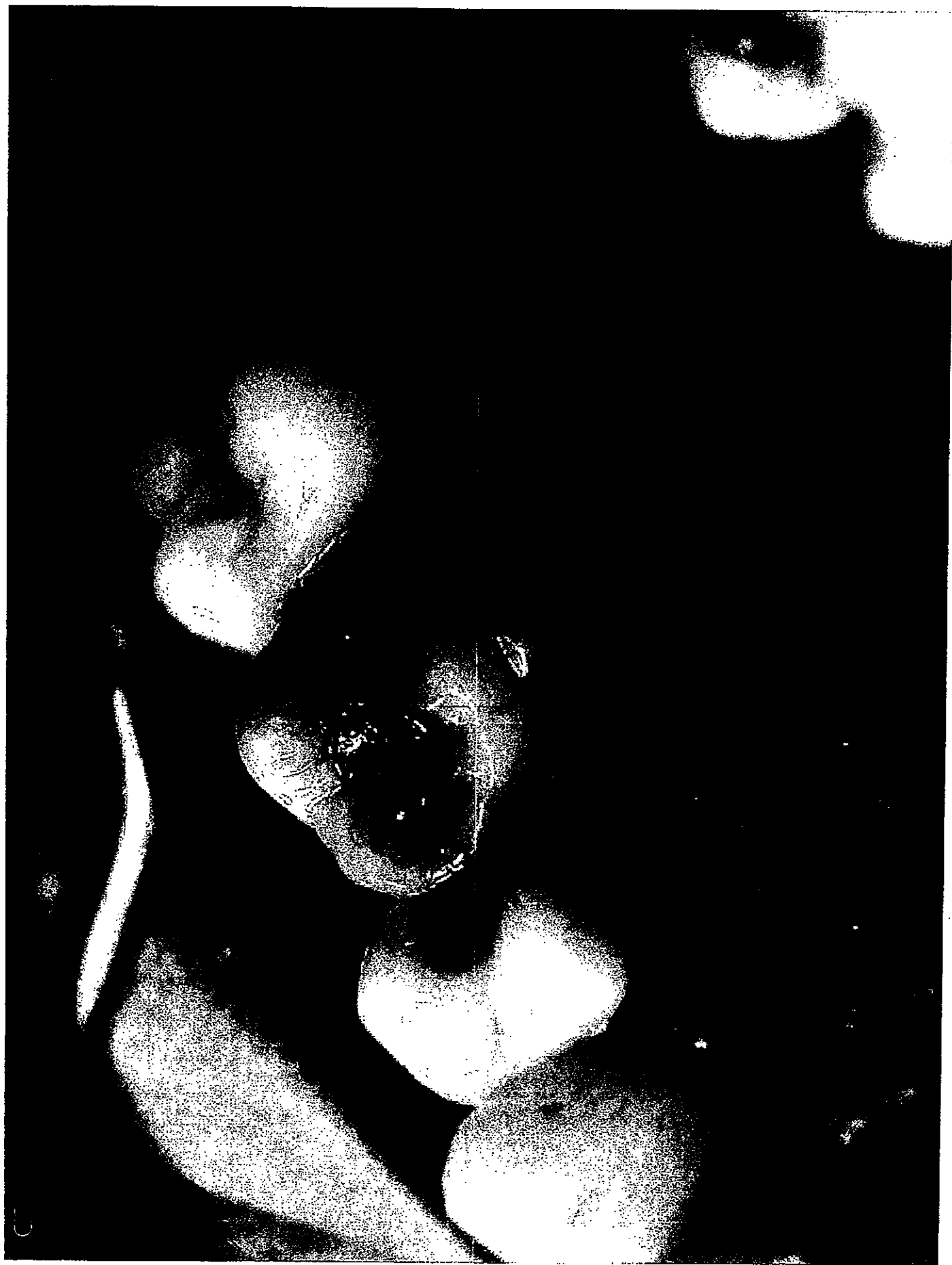
CASE TYPE

Type I.	Gingivitis	1-3 mm	1-3 hours
Type II.	Beginning Perio	3-4 mm	2-3 hours
Type III.	Slight Perio	4-5 mm	2-4 hours
Type IV.	Advanced Perio	6+ mm	6-12 hours

Twilite Periodontal Treatment Sulcular Debridement and Decontamination









W.H. Chen, DMD, MACD



W.H. Ch









W.H. Chen, D.M.

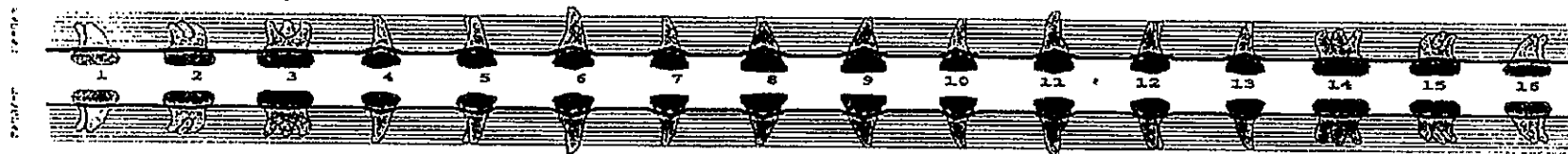


W.H. Chen, DMD, 1992

W.H. Chen, DMD, MAGD

CHILCUTT, FAY

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03-02-00	3 ³ 6	6 ² 5		5 ² 3	2 ² 3	2 ² 3	5 ² 3	3 ² 3	5 ² 3	4 ³ 3	4 ³ 3		3 ³ 3		

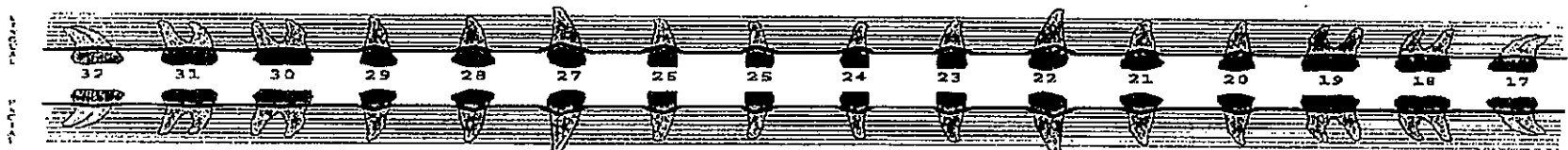


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RIGHT

LEFT

04-19-01	2 ¹ 2		2 ¹ 2	2 ¹ 2	2 ¹ 2	2 ¹ 2	2 ¹	1 ¹	2 ¹ 2	2 ¹ 2	3 ¹ 2			2 ³ 3	
11-05-01	3 ³ 3		2 ² 3	3 ² 3	3 ² 2	2 ² 2	2 ² 2	2 ² 2	2 ² 3	2 ² 3	3 ² 3			3 ³ 3	
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04-19-01	2 ² 2		3 ² 3	3 ¹ 3	2 ¹ 2	2 ¹ 2	2 ¹ 2	2 ¹ 2	1 ¹		3 ² 3			3 ² 3	

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940 Ezlase Perio



T.A.

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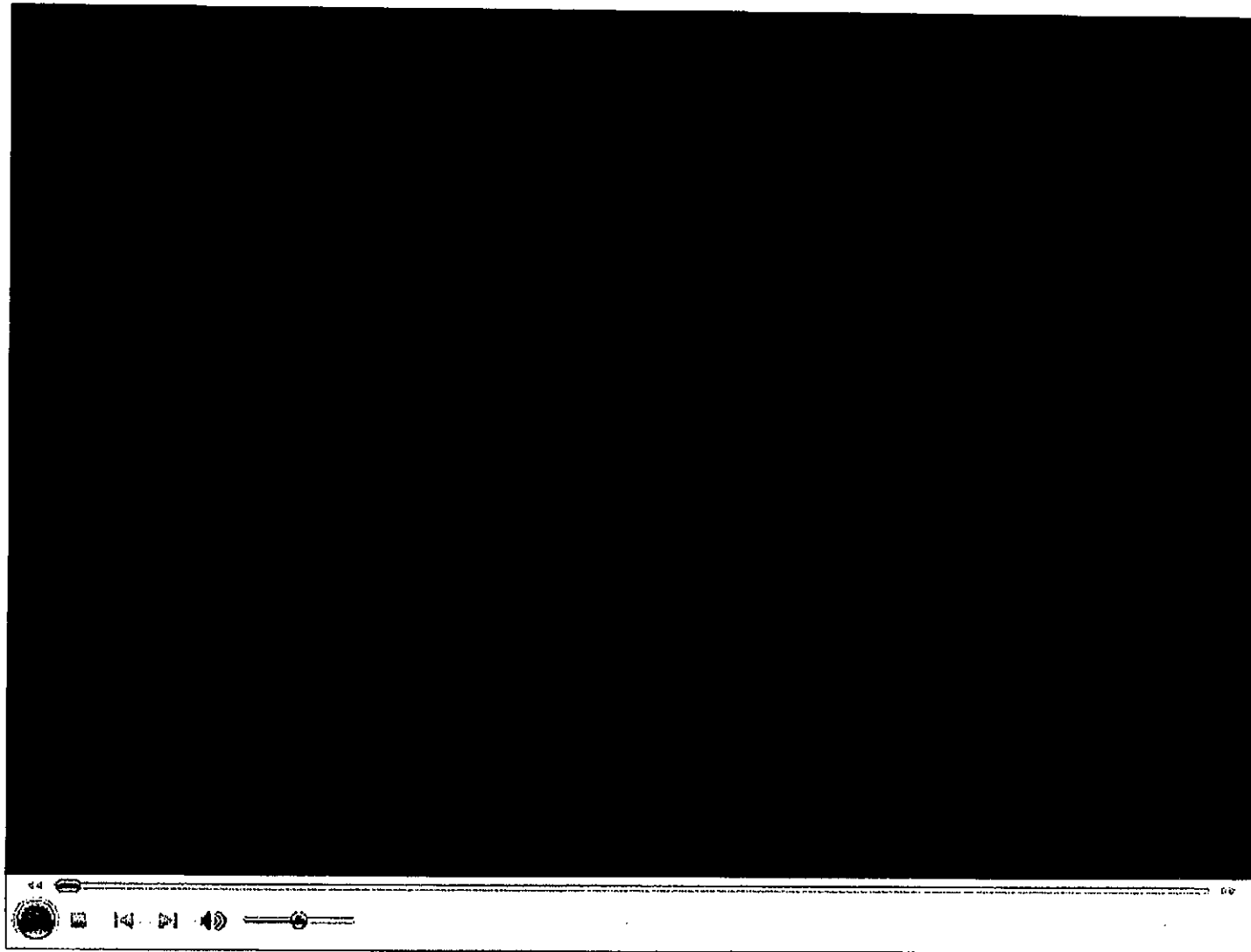
Periodontal Pockets Settings

- ◎ Peak Power 3.25 Watts
- ◎ Pulse Interval 0.20
- ◎ Pulse Length 0.05
- ◎ Average Power 0.66 Watts
- ◎ 300 um Micron Tip



B.M.

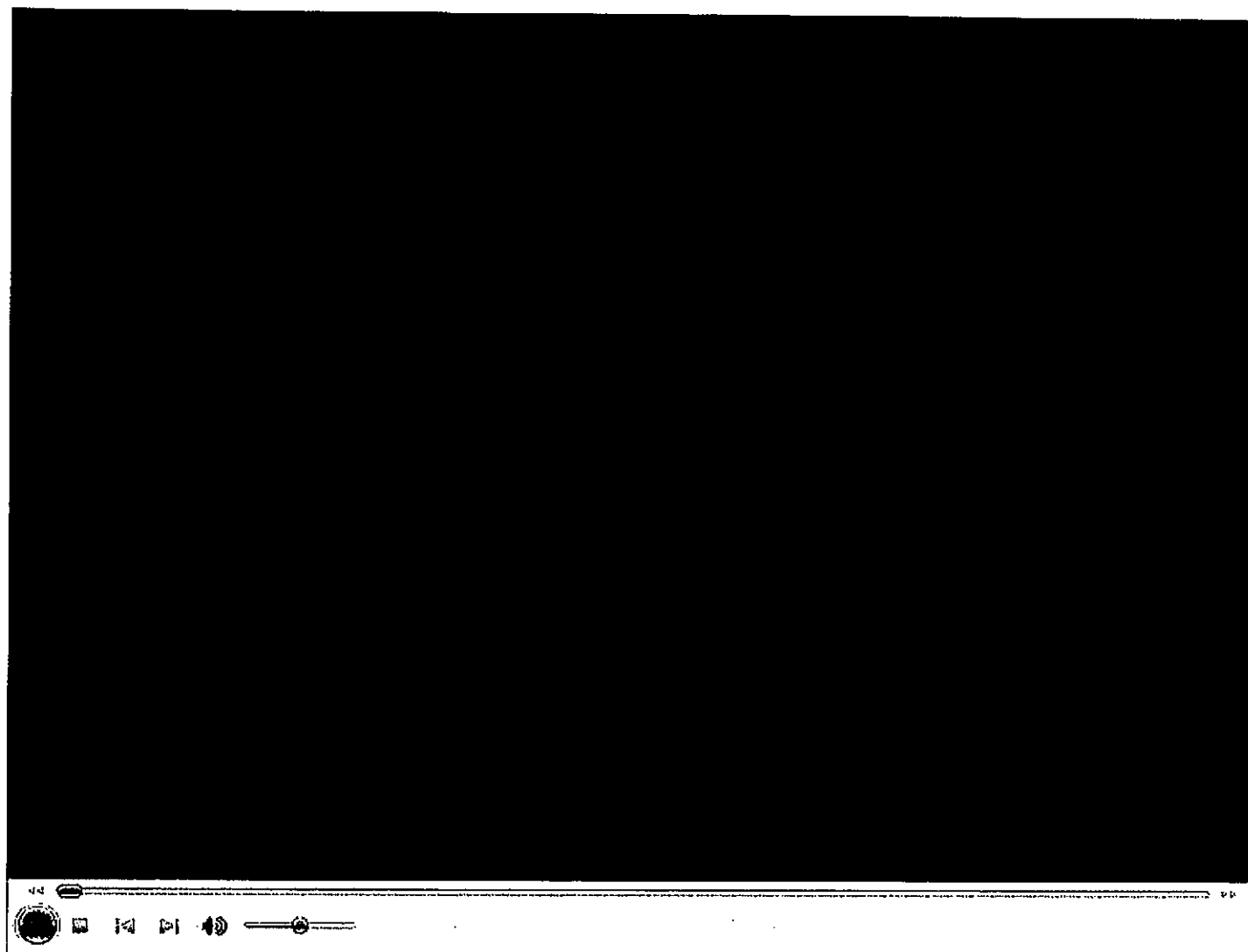
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B.M.

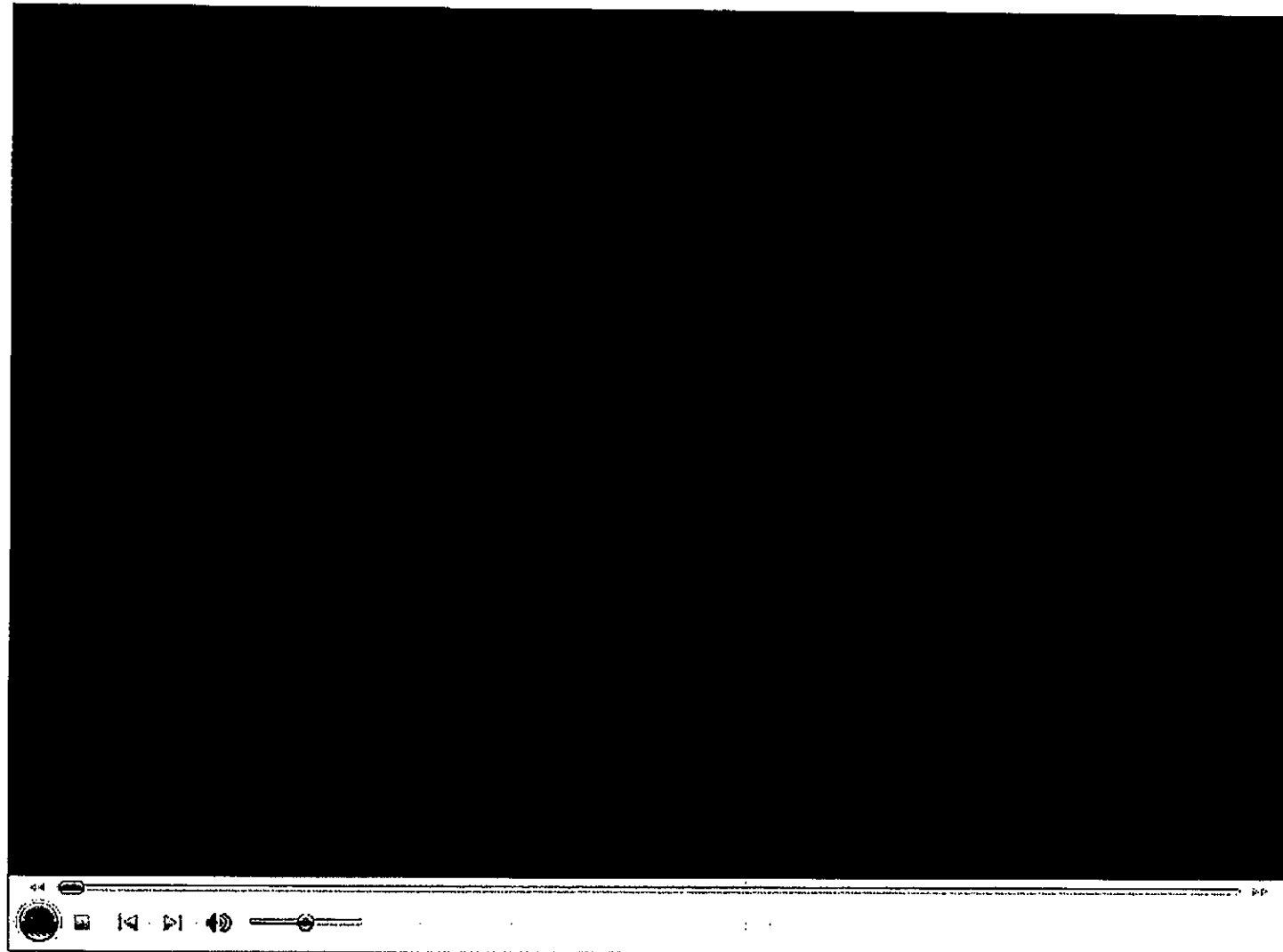


B.M.



B.M.

Implantitis Periodontal Pockets in Implant, Sulcular Debridement and Decontamination



P.K.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

DCM DCM DCM DCM DCM DCM DCM DCM MCD MCD MCD MCD MCD MCD MCD MCD

1 3

7 4 6 6 4 5 4 2 4 4 2 3 3 2 3 3 2 3 3 2 3 4 3 4 4 3 5 8 4 9

7 4 6 6 4 5 4 2 4 4 2 3 3 2 3 3 2 3 3 2 3 4 3 4 4 3 5 8 4 9

11 4 7 7 4 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 3 3 3 7 5 9

11 4 7 7 4 5 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 3 3 3 7 5 9

R L

2 4

11 7 10 11 5 6 4 3 4 4 3 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 4 4 5 9

11 7 10 11 5 6 4 3 4 4 3 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 4 4 6 9

10 4 10 10 4 10 3 4 3 10

10 4 10 10 4 10 3 4 3 10

32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17

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Root Planing using Twilite for
decontamination.

Scaled implant.

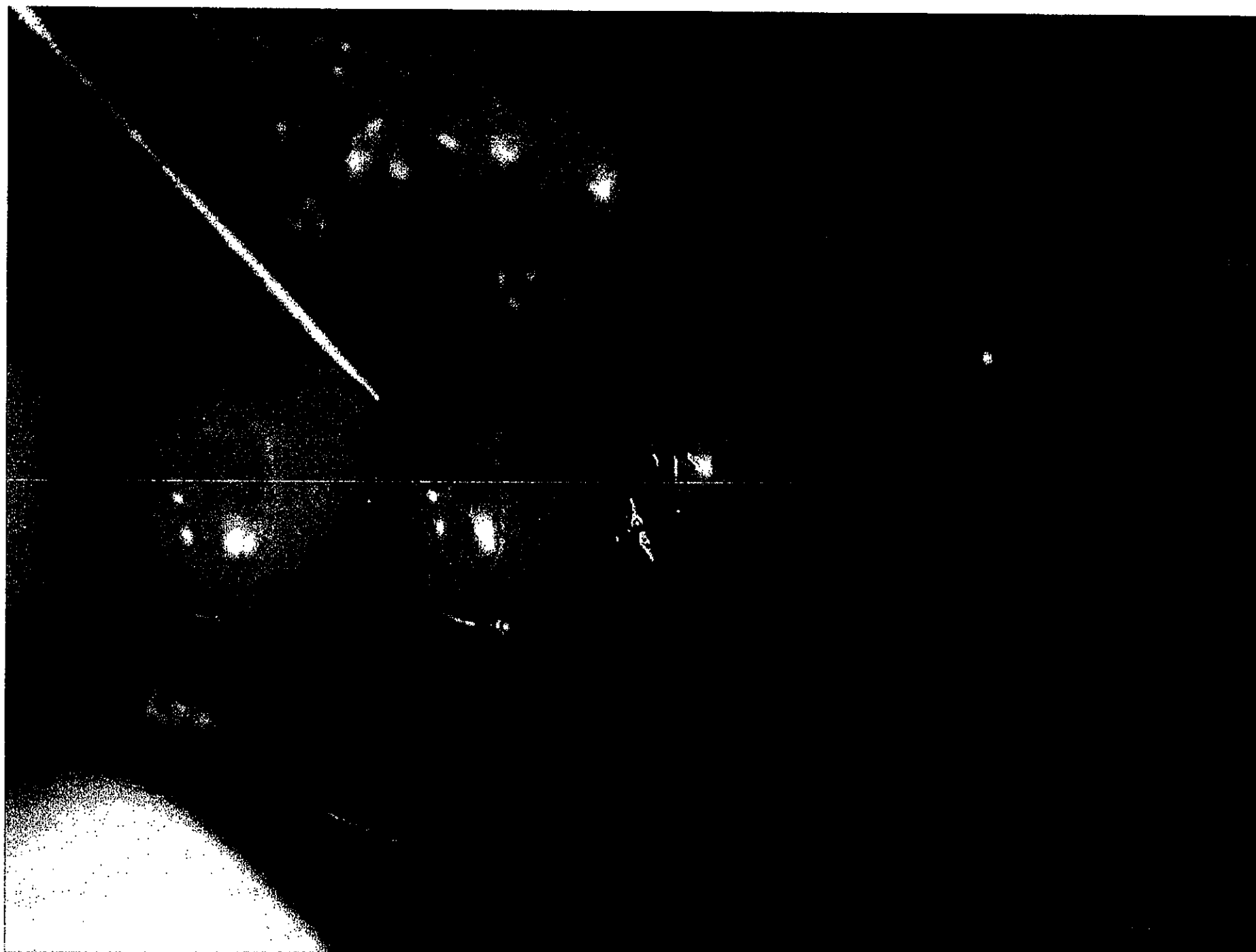
Irrigated with Peridex.





13, BEE, MAGD







W.H. Chen, DMD, MScD



W.H. Chen, DMD, MAGD



W.H. Chen, DMD, MAGD

**WILLIAM H. CHEN,
DMD, MAGD, MWICD, MALD, FACD, FICD**

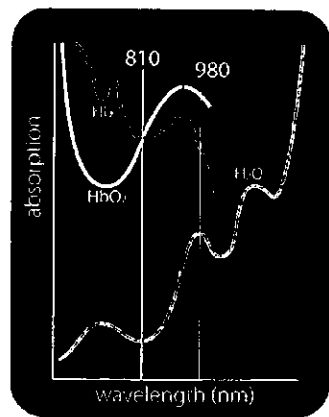
**P.O. Box 1178
4168 Nameoki Road
Granite City, IL 62040
Ph. (618) 931-2025
Fax (618) 931-8888
E-mail: chenlaser@gmail.com
Website: www.chenlaserinstitute.com**


Thank You

940 nm wavelength

Identified in clinical testing as most effective wavelength for hemostasis and patient comfort

cleaner cutting and faster hemostasis with better absorption by hemoglobin and oxyhemoglobin



ez  *It's not just a laser.*

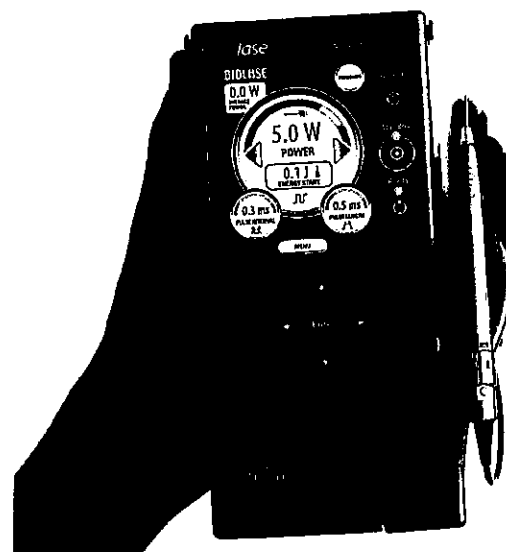
BIOLASE: FDA Clearance Approvals



EzLase

(940nm Wavelength Soft Tissue Diode Laser)

**William H. Chen, DMD, MAGD,
MWCLI, MALD, EdALD, FACD, FICD**



ez  *It's not just a laser.*

first 940 nm wavelength soft tissue diode laser to receive FDA 510k approval

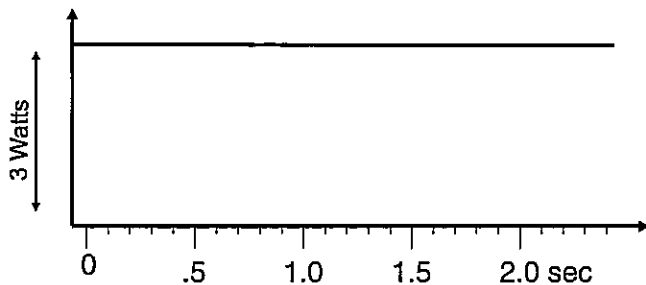
only soft tissue diode laser with ComfortPulse® pulse control for maximum patient comfort

Continuous Wave: The power is on all the time and is not subject to interruption.

Continuous Wave Mode

LASER Settings...Power: 3.0 Watts
Pulse Length: n/a
Rep Rate: n/a

AVERAGE POWER = 3.0 Watts



READY Button

Once the power switch, key access, and ON/OFF Key are set to the ON position, the READY button on the keypad must be pressed to enable the footswitch. The aiming beam will be lit to indicate that the system is ready for use.

Footswitch

The *eZlase™* will not emit laser energy until the user presses down on the footswitch. The footswitch is designed to work using wireless technology. One full charge of the battery will allow approximately one week of regular operation.

When the battery is low, a permanent cable should be connected to resume operation. For charging, unit must be turned ON. It takes 4 hours of charging time for full battery capacity.

■ NOTE: It is recommended to recharge the battery overnight every week.



Figure 3: Wireless Footswitch

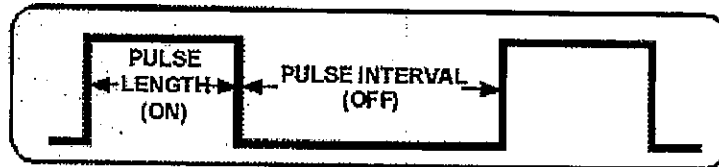


Figure 4: Footswitch to System Cable

Modes of Operation

- Continuous Wave
- Gated Pulsed Mode
- Free-Running Pulsed Mode

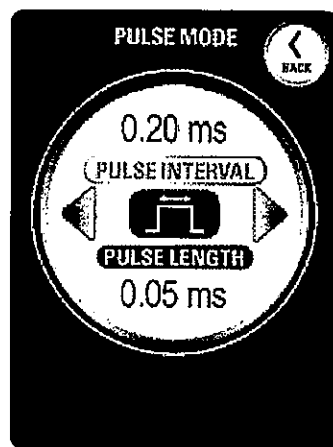
Pulse Interval



- Laser OFF time allows tissue cooling.

Gated (Pulsed) Mode:
The energy is interrupted by electrical or mechanical means and the resultant energy delivered to the target tissue is thereby altered.

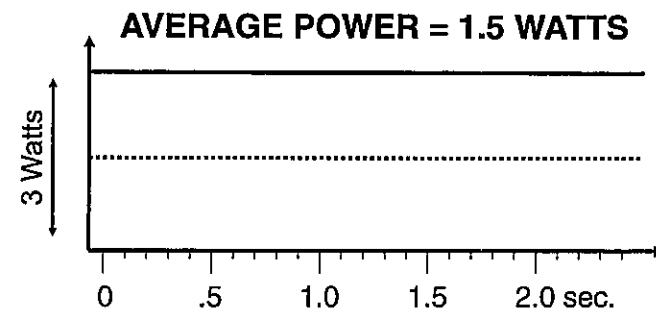
Pulse Length



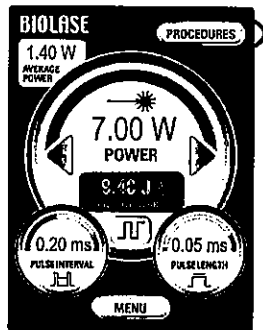
- Laser ON time is when the actual energy is applied.
- Longer PL generally causes more thermal effects and less bleeding.

Gated (Pulsed) Mode

LASER Settings... Power: 3.0 Watts
Pulse Length: 0.5 seconds
Rep Rate: 10 per second



Energy, Pulse Menu, **ezlase™**

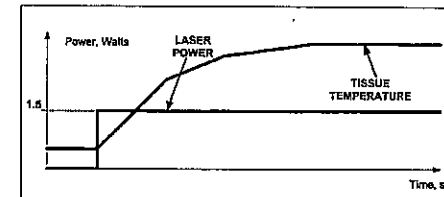


3 pages, 15 pre-sets

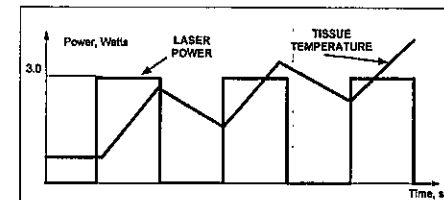


Beep – 3 levels
Aiming – 5 levels

ezlase™ Pulsed Mode



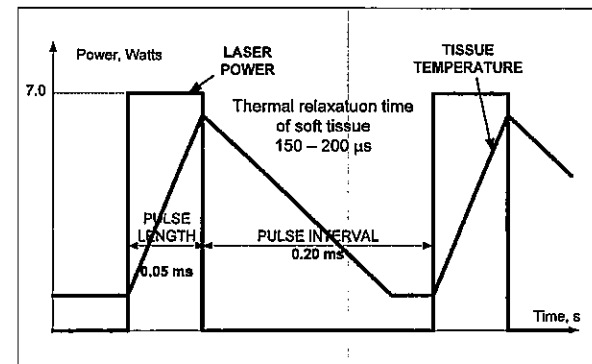
CW mode



Regular "pulsed"
50/50%

Laser-Tissue Interaction

Unique **ezlase™** pulsed mode
"cool cutting" - **Comfortpulse™**



Laser-Tissue Interaction

PHOTO-THERMAL Effect

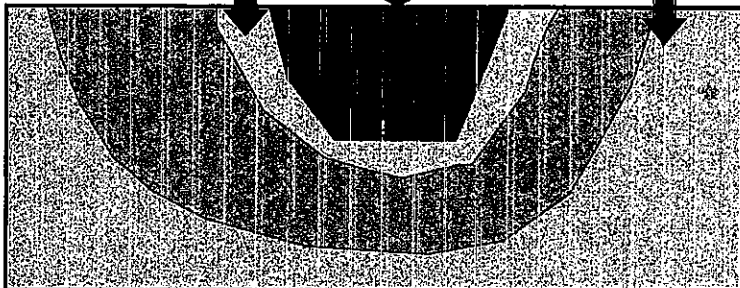
Tissue Effects Caused by Thermal Exposure

Zone of Necrosis –

tissue is irreversibly damaged and will die

Zone of Coagulation –

most of the tissue will recover and return to normal



Laser-Tissue Interaction

- **Reflected**
- **Absorbed**
- **Transmitted** (Refracted)
- **Scattered**

Laser-Tissue Interaction

■ **Absorbed**

Dependent on Laser Wavelength,
Tissue Composition, Pigmentation
and Water Content



Laser-Tissue Interaction

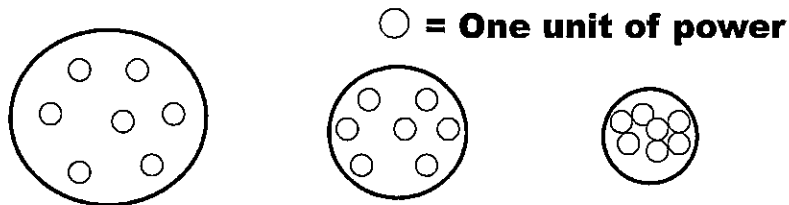
Thermal Relaxation

The time that the laser energy is OFF is referred to as the thermal relaxation time, the time during which the target tissue is allowed to cool.

Power Density:

Watts per centimeter squared

When people discuss the efficiency of different fiber diameters, they are really asking about the effect of Power Density.



The smaller the diameter of the fiber, the more power per square centimeter.

Laser-Tissue Interaction

Power Intensity
+ Exposure Time
+ Spot Size

POWER DENSITY (W/cm²)

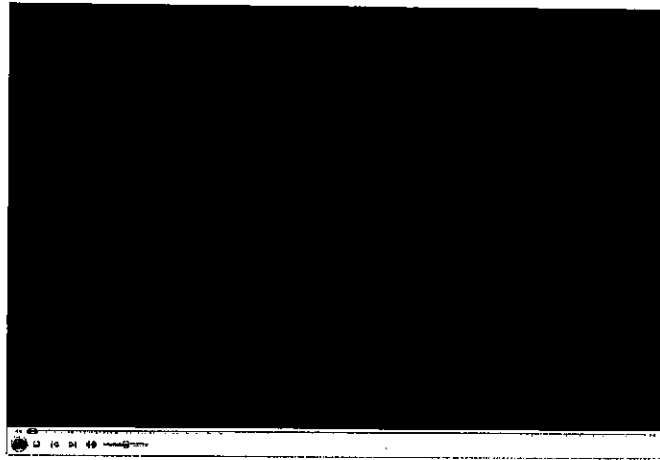
Laser-Tissue Interaction

Power Density

+ Duration of Exposure, Amount of Cooling
+ Specific Wavelength, emission mode
+ Tissue Characteristics

BIOLOGIC EFFECT

Ezlase Setup



Thermal Effect of Laser on Tissue

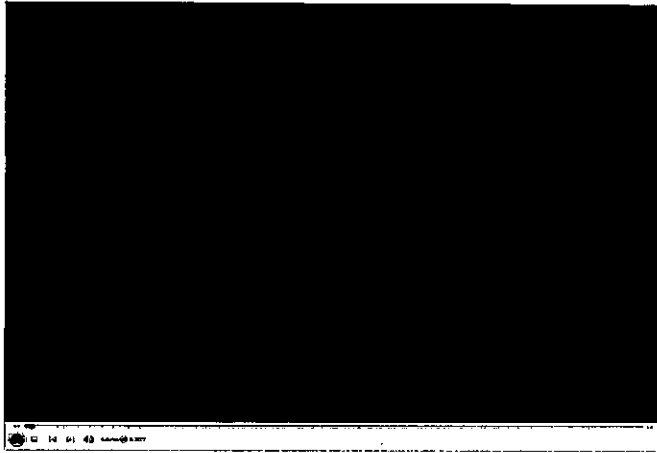
<u>Tissue Temperature(C)</u>	<u>Observed Effect</u>
37-50	Hyperthermia
> 60	Coagulation
	Protein Denaturation
70-90	Welding
100-150	Vaporization
> 200	Carbonization

Changing Tips

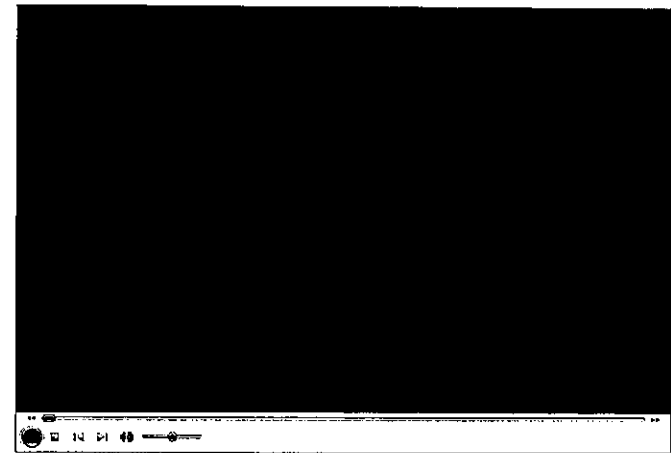


Preparation of the Ezlase

Changing Corks



Initiation of Tip

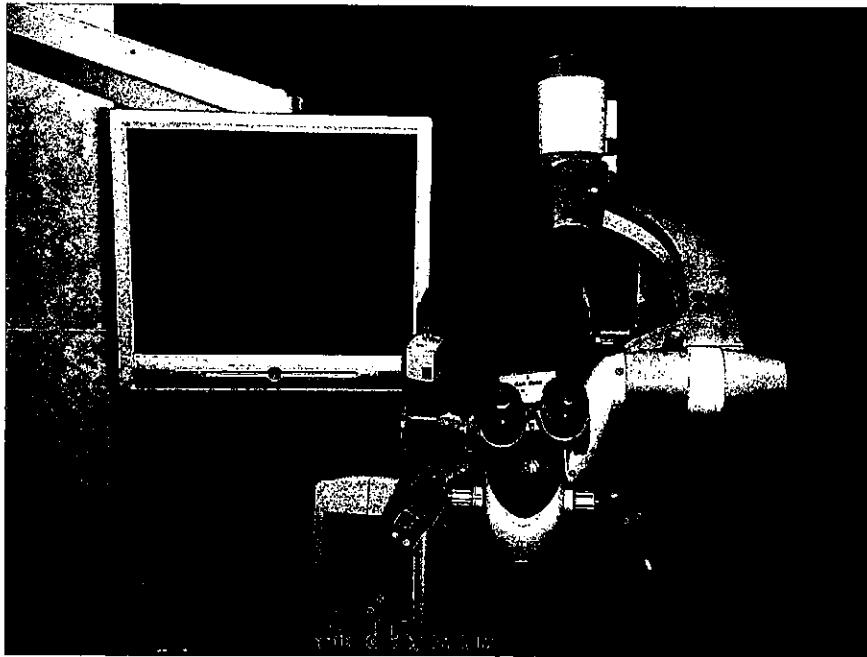


Initiation of Tip with Accu Film



Initiation Settings

- 2.75 Watts
- CW
- Fiber Tip of Choice (300 or 400)



Bending the Tip



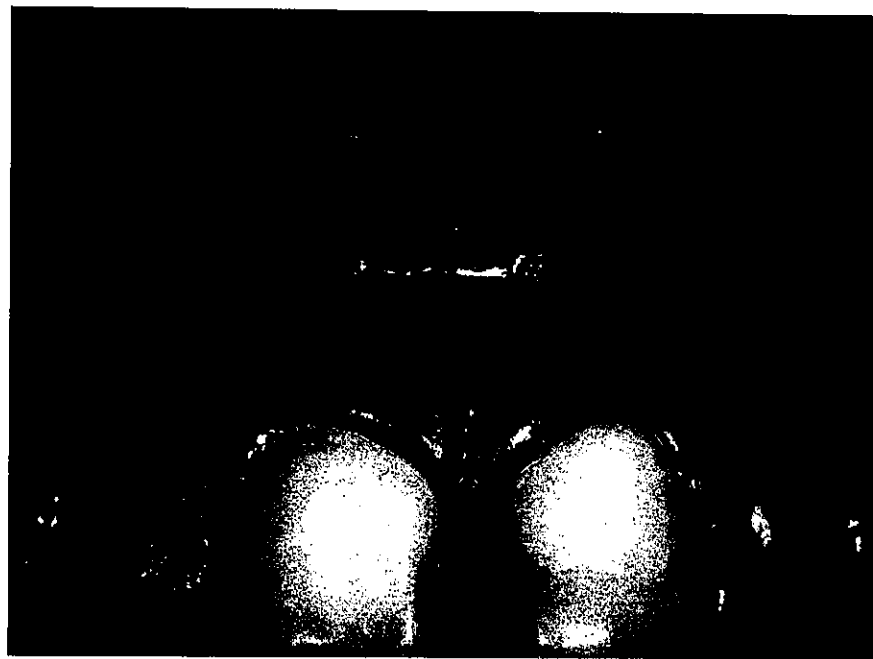
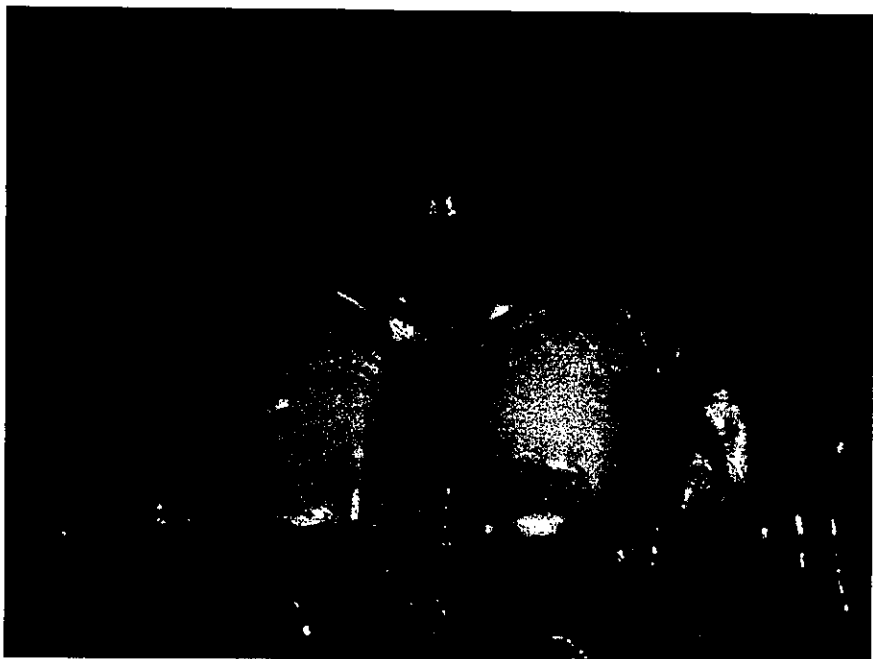
EzLase Clinical Applications

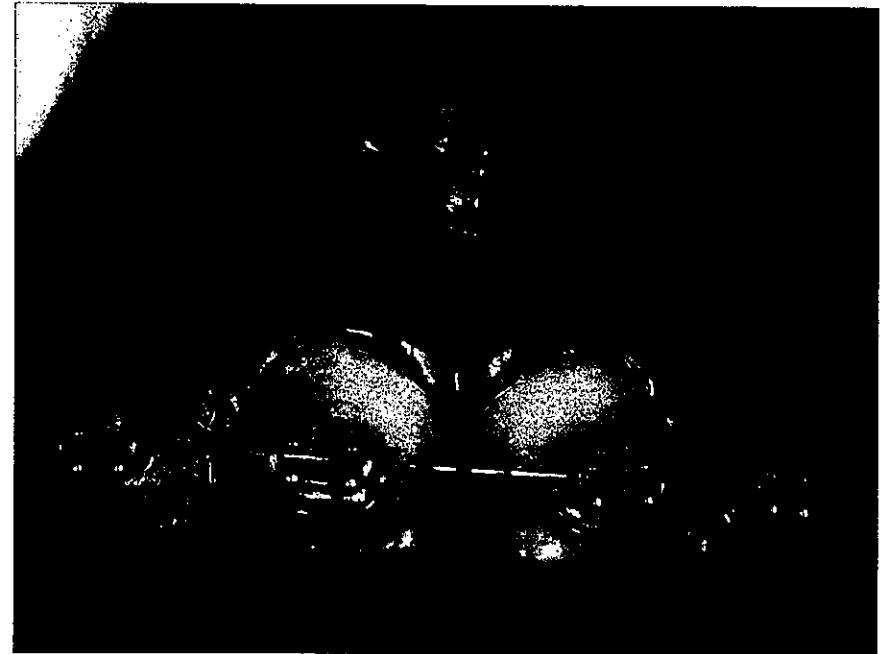
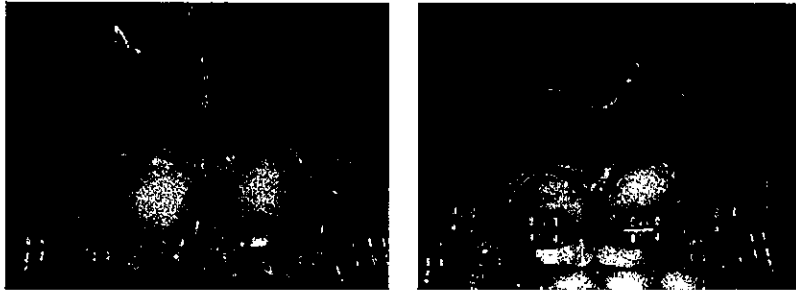




Frenectomy Maxillary

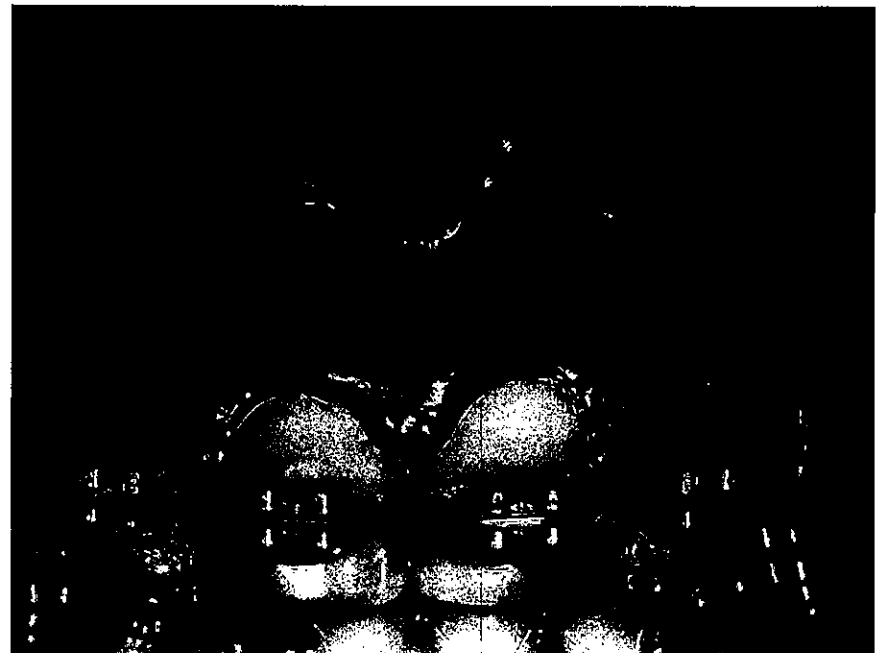






Maxillary Frenectomy Settings

- Peak Power: 5.00 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 1.00 Watt
- 300 um Tip



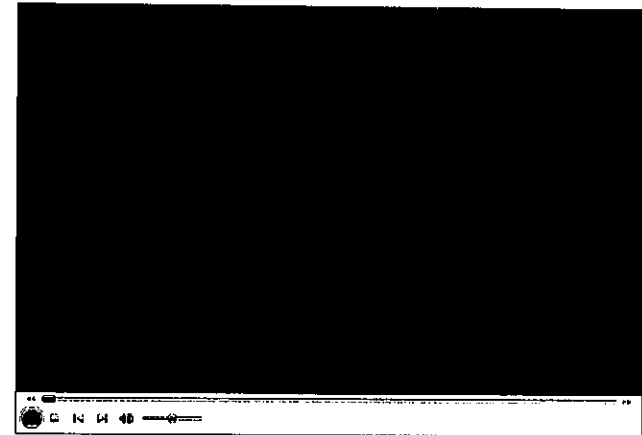
Frenectomy

Mandibular



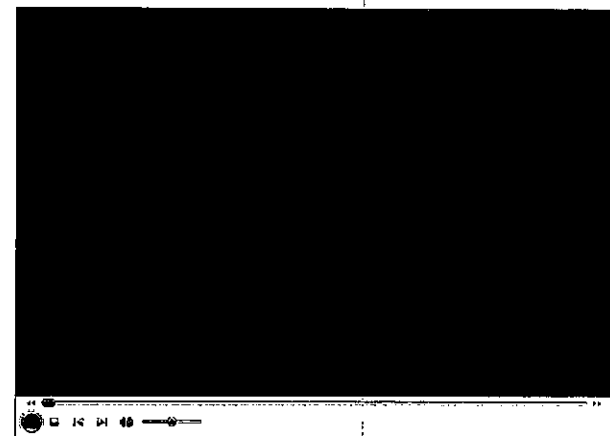
S.S.

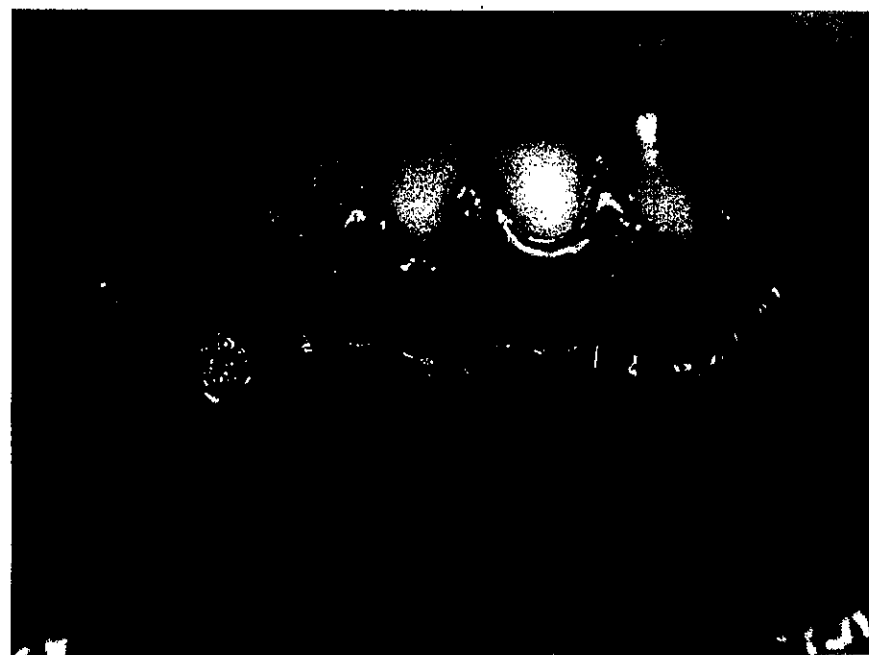
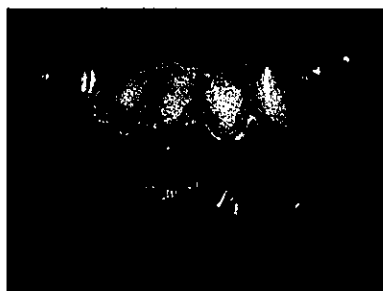
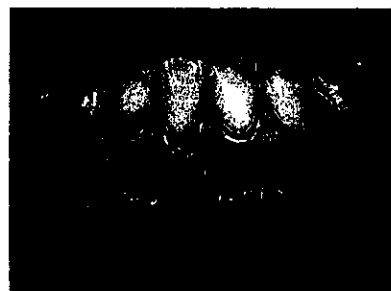
Maxillary Frenectomy



S.S.

Maxillary Frenectomy







Before



1 Week Post-op

Mandibular Frenectomy using the Diode Laser



Before



During



After

3 Days Postop

10 Days Postop

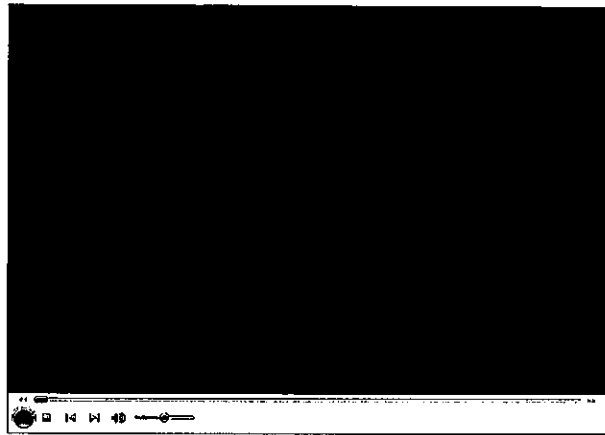
© William H. Chen, DMD, MAGD, EdALD, MWICD, MALD, FACD, FICD

Mandibular Frenectomy Settings

- Peak Power: 5.00 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 1.00 Watt
- 300 um Tip



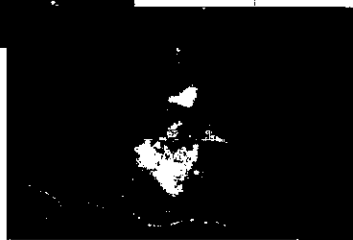
Lingual Frenectomy



J.W.



Pre-op



1 Week Post-op



3 Weeks Post-op

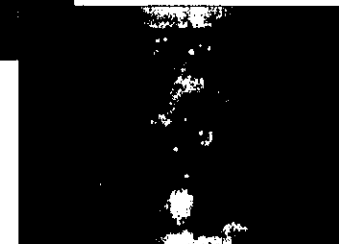
Lingual Frenectomy



E.D.



Pre-op



3 Days Post-op



1 month Post-op

Aphthous Ulcer Treatment

Lingual Frenectomy Settings

- Peak Power: 7.00 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 1.40 Watt
- 300 μ Tip

Biostimulation Settings

- No Fiber Tip
- Power: 1.00 Watt
- CW
- Energy: 40 Joules/cm²

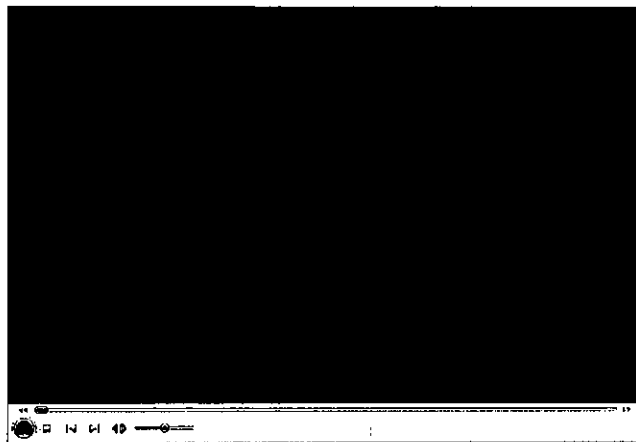


Aphthous Ulcer Treatment Settings

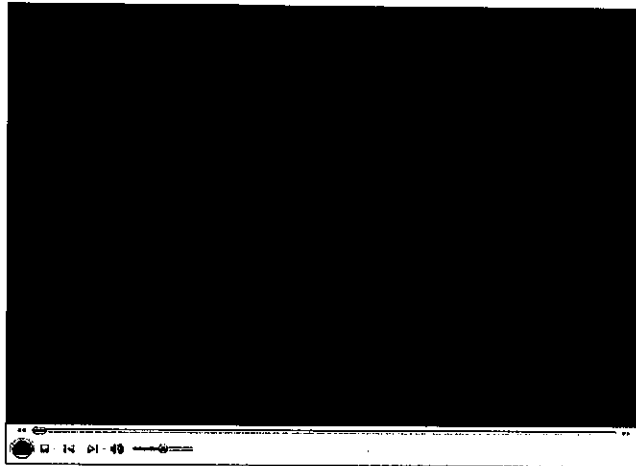
- Peak Power: 2.00 Watts
- Continuous Wave Mode
- Do not initiate tip
- 400 um tip



Aphthous Ulcer Treatment



Biopsy:



J.M.

Biopsy Settings

Ezlase 940

- 1.00W, CW
- 1.50W, CW
- 2.00W, CW
- 2.5, CW New Tip

LLLT

- 1.00W, No HP, No Sheath, No Tip
- 40 J/cm²

Aphthous Ulcer Treatment



Pre-op



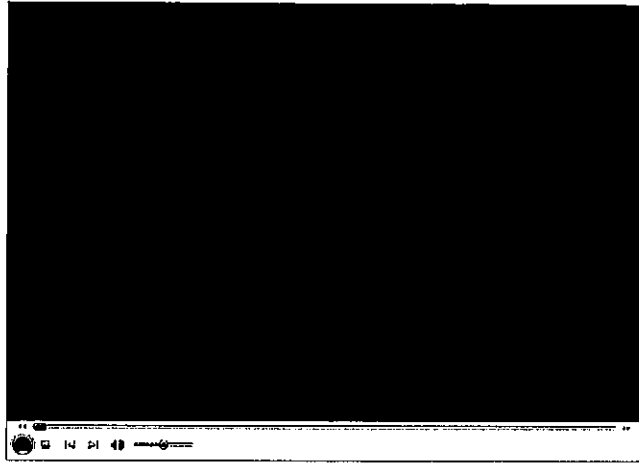
6 Days Post-op

A.P.

Aphthous Ulcer Treatment Settings:

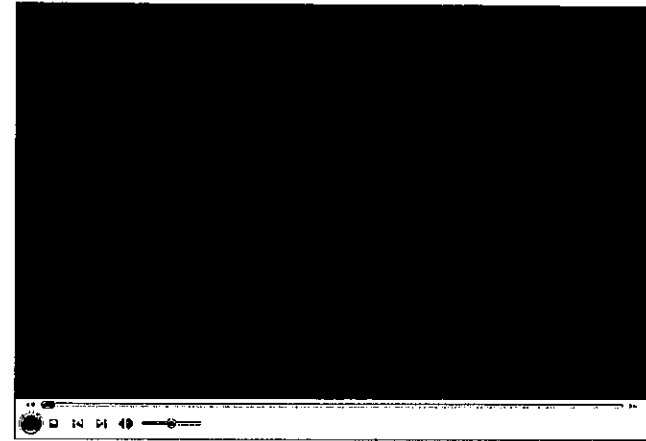
- Remove fiber tip
- Remove handpiece
- Direct laser beam on target tissue
- 1 Watt
- CW
- 40 Joules/cm²

Biopsy:



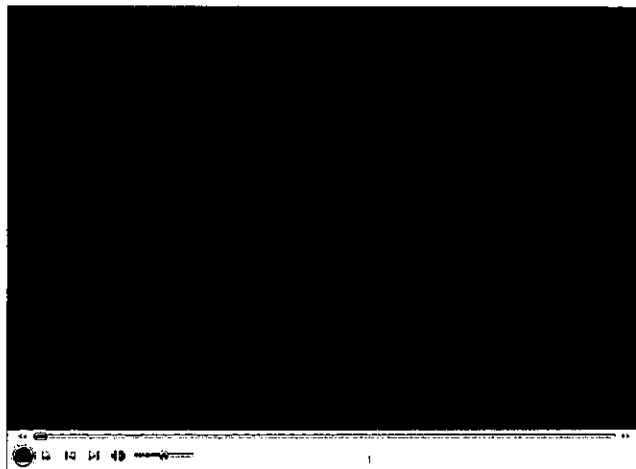
K.W.

Biopsy: Squamous Papilloma in the Palate



C.H.

Operculectomy: Distal of #31



S.B.

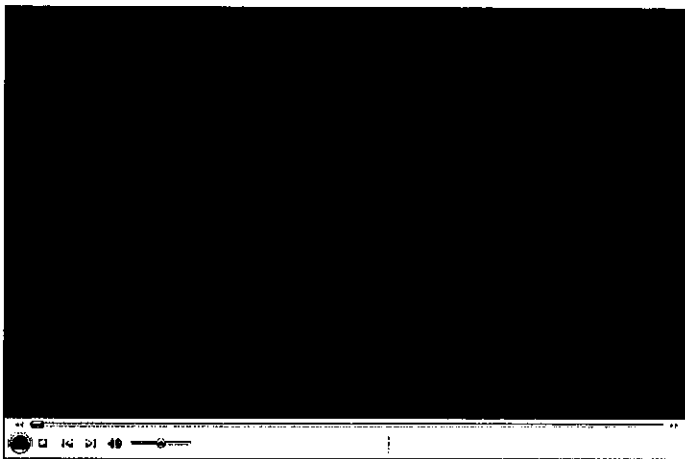
Biopsy Settings

- Peak Power: 4.50 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.9 Watt
- 300 um tip

Gingivectomy Settings

- Peak Power: 4.50 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.9 Watt
- 300 um Tip

#12 Gingivectomy

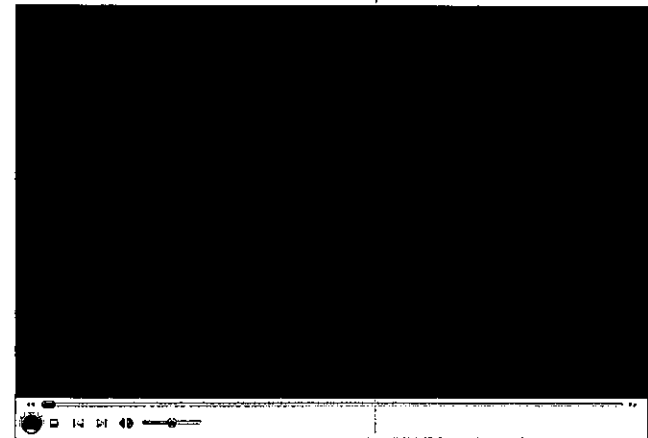


B.D.

Operculectomy Settings

- Peak Power: 2.50 Watts
- Pulse Interval: 1 ms
- Pulse Length: 0.50 ms
- Average Power: 0.83 Watt
- 300 um Tip

Gingivectomy: Mesial of #15 to Remove Decay



J.M.

Crown Troughing Settings

Peak Power: 5.00 Watts
Pulse Interval: 0.2 ms
Pulse Length: 0.1 ms
Average Power: 1.66 Watt
300 um Tip

Gingivectomy Settings

- Peak Power: 3.25 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.65 Watt
- 300 um Tip

940 Troughing

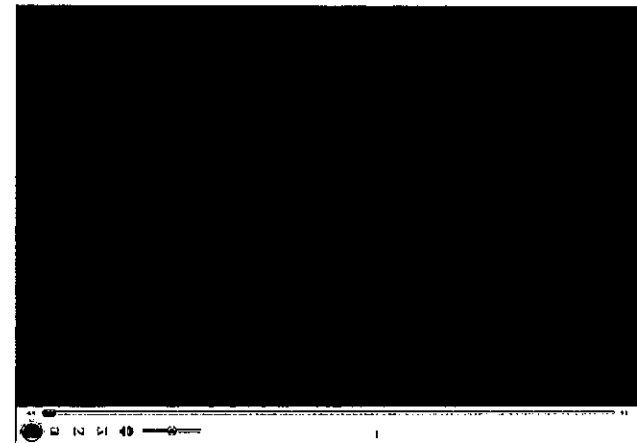


5 Watts, PI-.2ms, PL-.1ms, AP-1.66

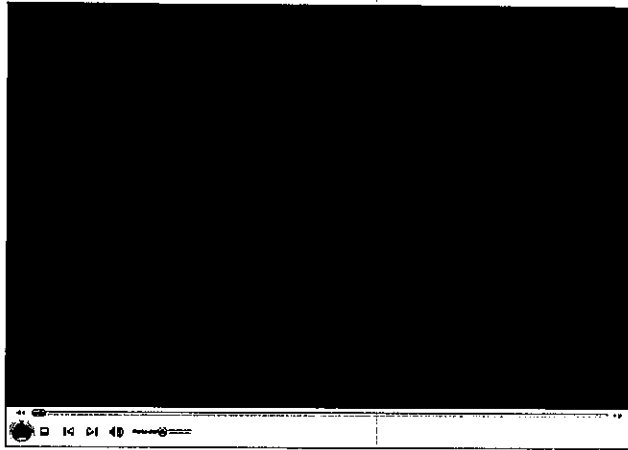


5 Watts, PI-.2ms, PL-.05ms, AP-1.00

Crown Troughing: #31 for Impression

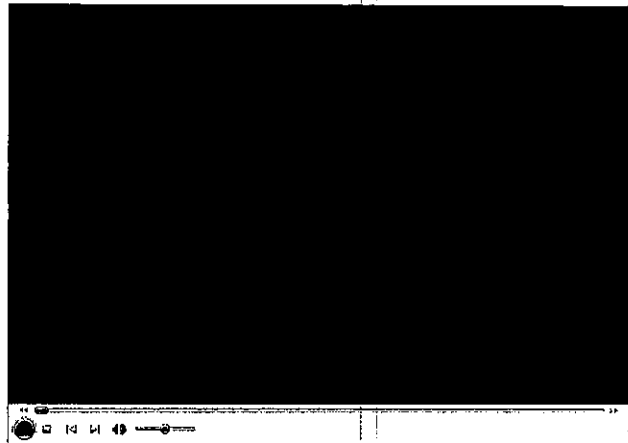


E4D Crown Troughing:



M.E.

Crown Lengthening: For bonded-bridge for #6, 11

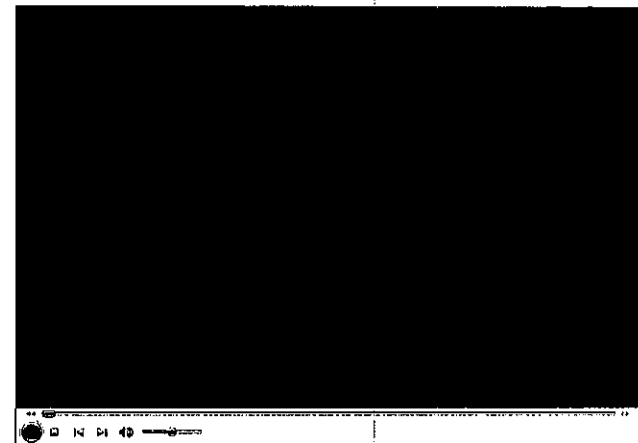


C.F.

Biopsy Settings

- Peak Power: 4.50 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.9 Watt
- 300 um Tip

Crown Troughing: for CAD-CAM

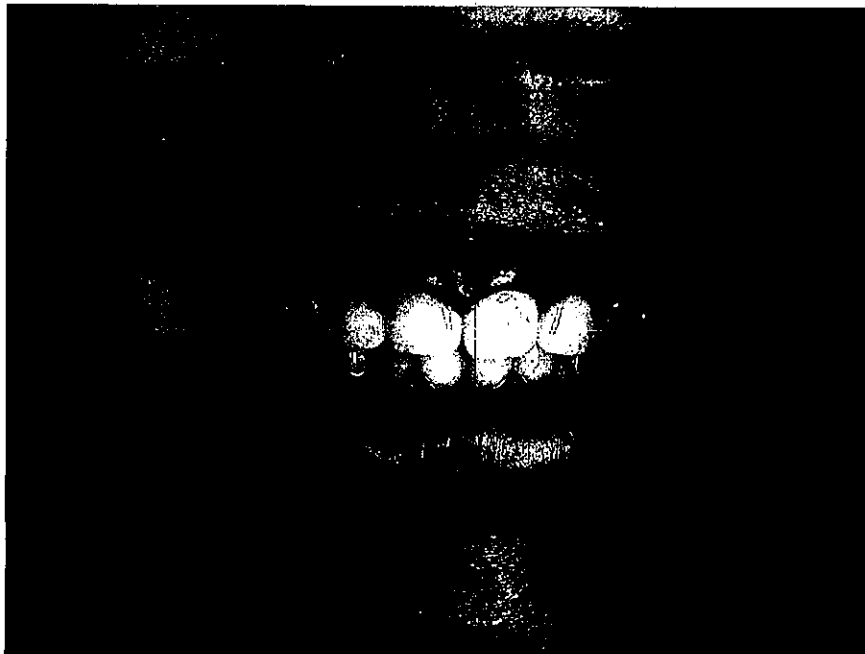


T.P.

Crown Lengthening: Soft Tissue

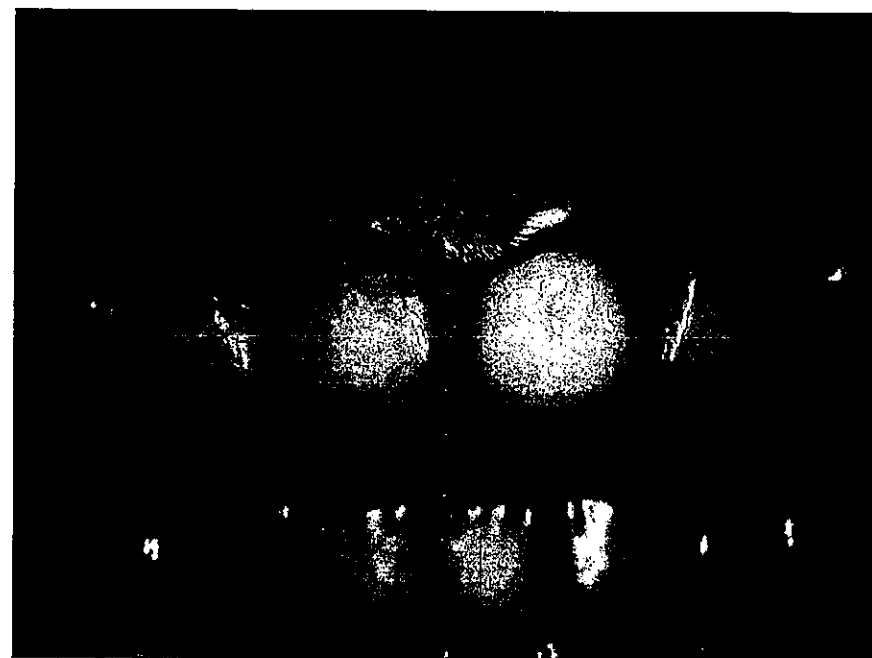
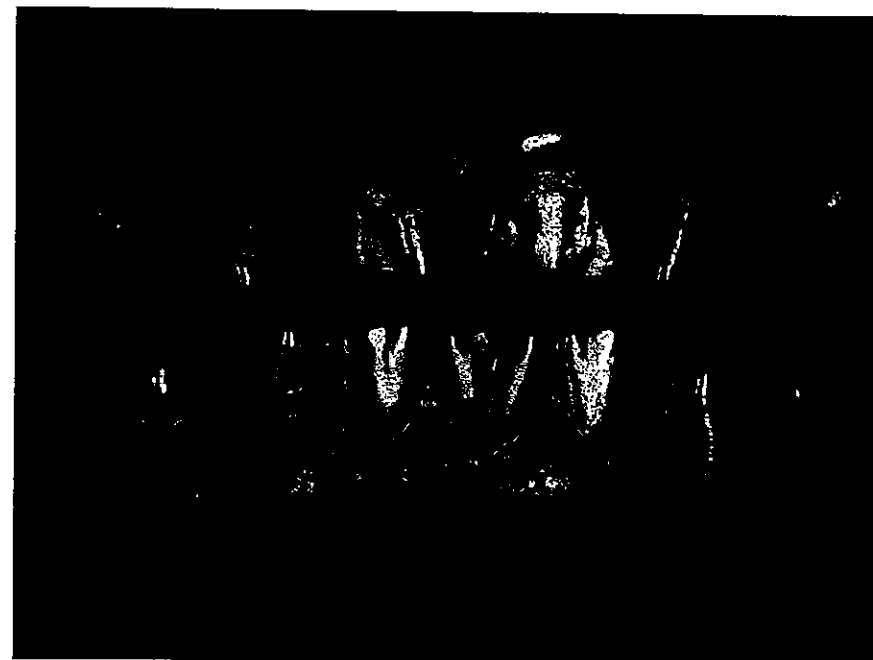
Crown Lengthening Settings

- Peak Power: 5.0 Watts
- Pulse Interval: 0.2 ms
- Pulse Length: 0.05 ms
- Average Power: 1 Watt
- 400 um Tip



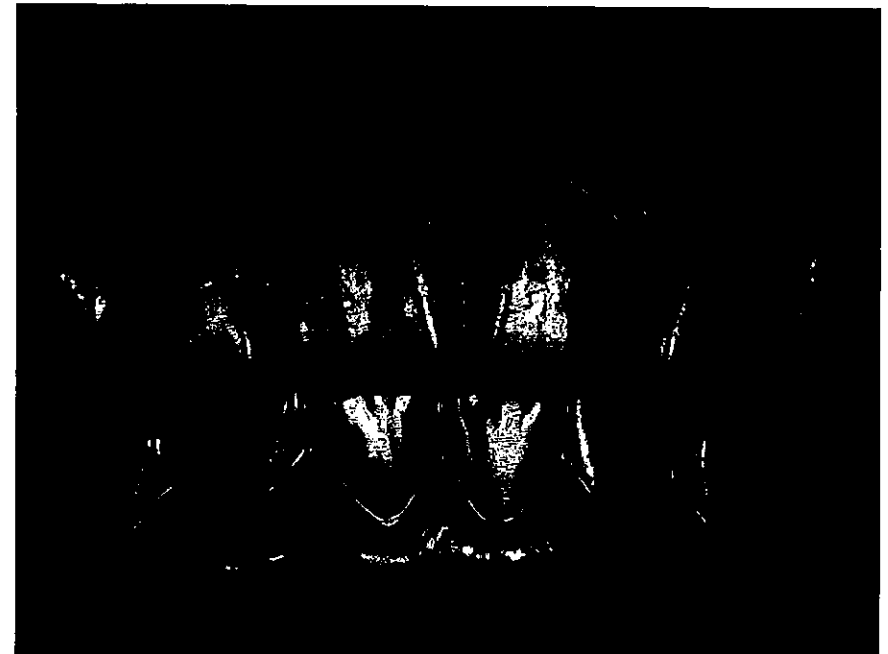
Crown Troughing Settings

Peak Power: 5.00 Watts
Pulse Interval: 0.2 ms
Pulse Length: 0.05 ms
Average Power: 1.00 Watt
300 um Tip

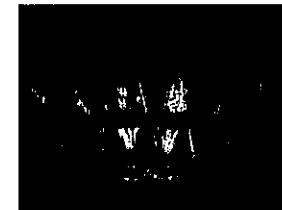
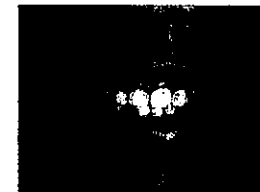
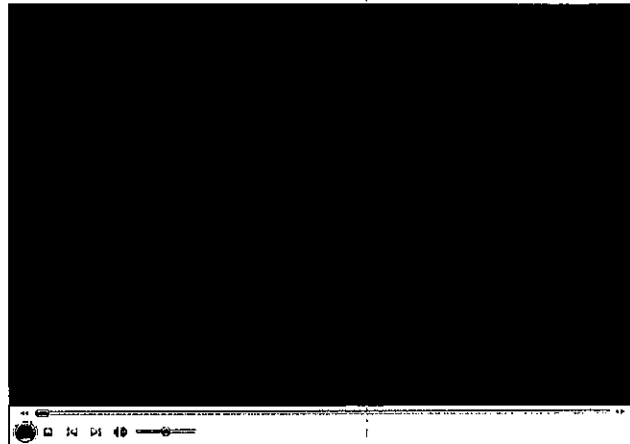


Soft Tissue Crown Lengthening Settings

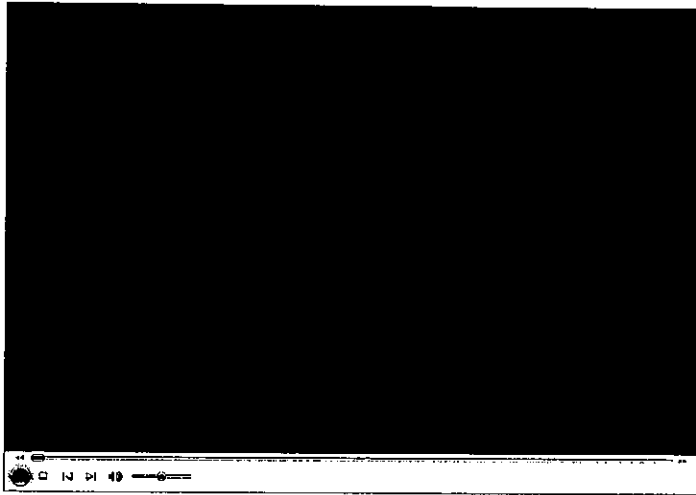
- Peak Power: 4.5 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.90 Watt
- 300 um Tip



Distal Wedge Gingivectomy #18



Implant Uncovering

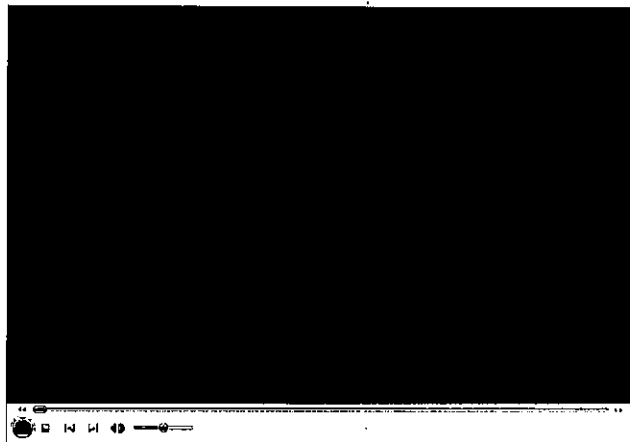


S.W.

Distal Wedge Gingivectomy Settings

- Peak Power: 2.50 Watts
- Pulse Interval: 1 ms
- Pulse Length: 0.5 ms
- Average Power: 0.83 Watt
- 300 um

Implant Uncovering: #15 for Abutment Placing



B.S.

Implant Uncovering



S.W.

Post-op



K.C.

Implant Uncovering Settings

- Peak Power: 3 Watts
- Pulse Interval: 0.2 ms
- Pulse Length: 0.05 ms
- Average Power: 0.6 Watt
- 400 um Tip

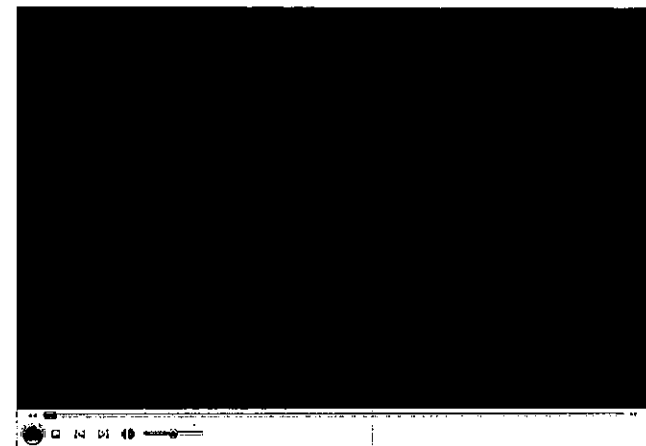
Settings

400 um Tip

Pulpotomy

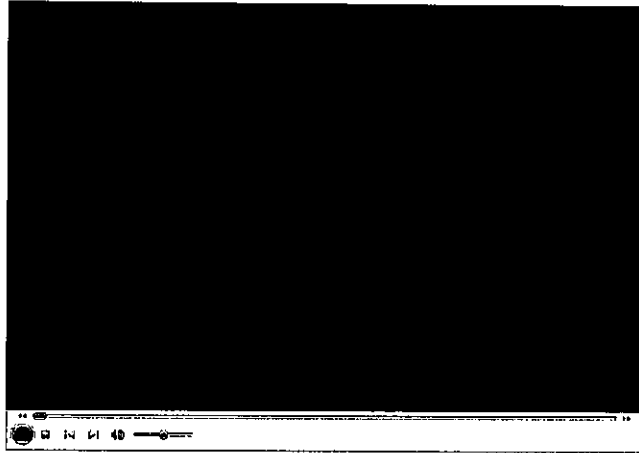
- 4 Watts (PP), 20 ms (PI), 20 ms (PL), 2 Watts (AP)
- Hemostasis
- 1-2 Watts, CW
- I&D
- 3 Watts (PP), 20 ms (PI), 20 ms (PL) 1.5 Watts (AP)

Pulpotomy, Hemostasis, and Incise & Drain of #K



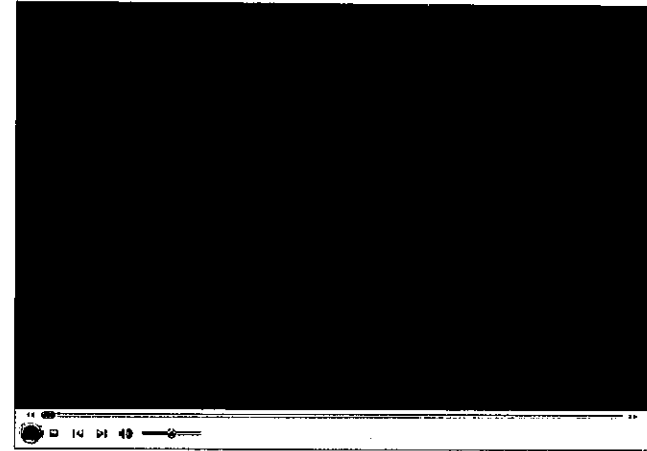
K.C.

Laser Analgesia Before Operculectomy



S.C.

Pulpotomy and Incise and Drain of #J



H.S.

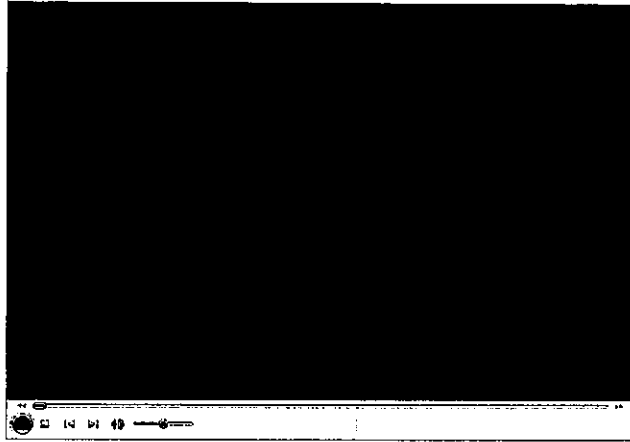
EzLase Laser Analgesia Settings

- Remove fiber tip
- Direct laser beam on target tissue
- 1 Watt
- CW
- 62 Joules/cm²

Pulpotomy- I & D Settings

- 3-4.00 Watts
- 0.05 PI
- 1.00 PL
- 400 micron tip

Endo Laser Analgesia of #28 (instead of injection anesthesia)

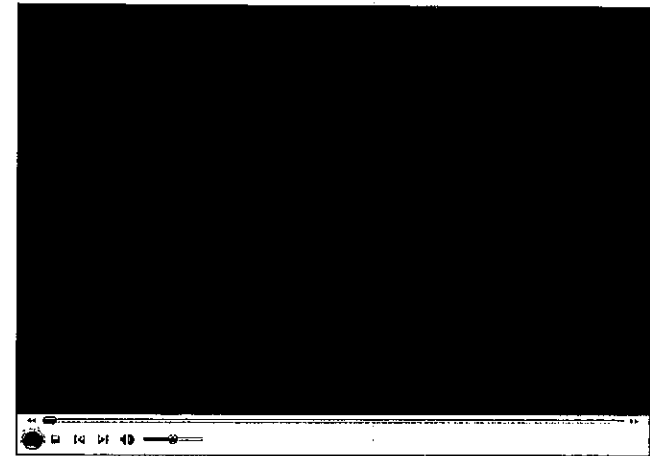


W.Y.

Settings

- 1.50 Watts
- CW
- 420-620 Joules

Endo Decontamination of #11



D.P.

Endodontic Decontamination Settings

- 2.00 Watts
- 20 PI
- 20 PL
- 1.00 Watt Average Power
- 60 Joule
- 300 micron tip
- 60 seconds

Incision for Flap Settings

- Peak Power: 3.25 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 0.65 Watt
- 300 um Tip

Incision for Flap

Perio Therapy: Pocket Reduction and Biofilm Removal of #4, 5



No air, water cooling
– Some Charring

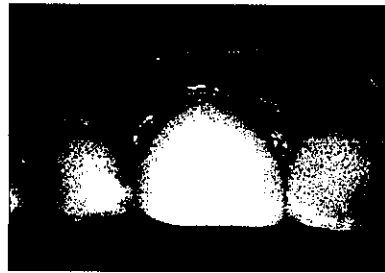


Air & water cooling
– No Charring

Biofilm Removal Settings



Pre-op



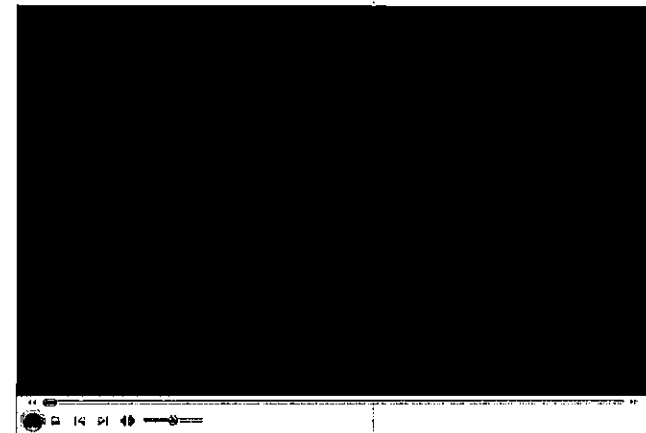
Post-op

- Peak Power: 5.00 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 1.00 Watt
- 300 um Tip

Biofilm Removal Settings

- Peak Power: 5.00 Watts
- Pulse Interval: 0.20 ms
- Pulse Length: 0.05 ms
- Average Power: 1.00 Watt
- 300 um Tip

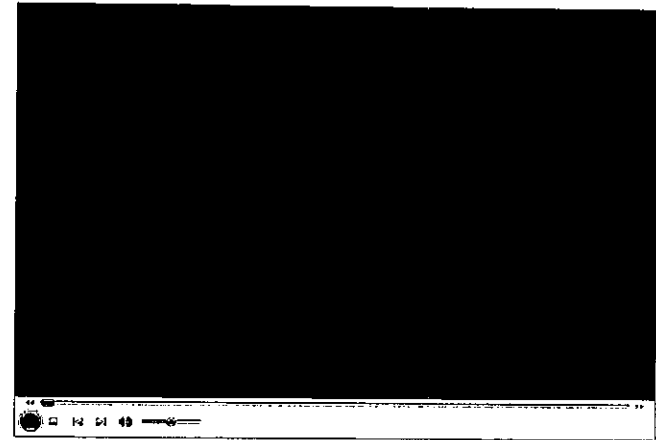
Perio Therapy: Pocket Reduction and Biofilm Removal of #7, 8



Coagulation of Extraction Site Settings

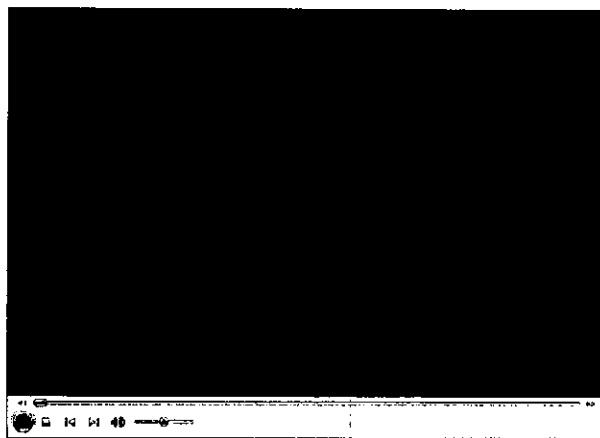
- 1.00-2.00 Watts
- 300 micron tip
- Continuous Wave Mode

Coagulation



L.B.

EzLase Hemostasis & Biostimulation



Coagulation



Pre-op



Post-op – 1 week

L.B.

**William H. Chen, DMD,
MAGD, MALD, EdALD,
MWCLI, FACD, FICD**

**P.O. Box 1178
4168 Nameoki Road
Granite City, IL 62040
Ph. (618) 931-2025
Fax (618) 931-8888
E-mail: chenlaser@gmail.com
Website: www.chenlaserinstitute.com**

Thank You

EzLase Hemostasis & Biostimulation

Pre-Op

1 week Post-Op



EzLase Hemostasis & LLLT Settings

- Hemostasis
 - 1 Watt, CW, Initiated Tip
- LLLT
 - 1 Watt, CW, Without Tip

ezlase™ Whitening Key Features

- Full-mouth whitening in less than 20 minutes of in-office treatment time[†]
- Best whitening improvement compared to other solutions, in similar tests
- Excellent results right away, and even more dramatic improvement after 24 hours
- Desensitizer gel included to help reduce sensitivity if necessary
- Only required training is for ezlase™ laser system

[†] Does not include prep and post treatment preparation

waterlase® dentistry

Reasons to Choose the ezlase™ Whitening System

Why offer whitening?

- To make your patients even happier with a beautiful smile
- To provide your practice with another source of revenue

Why offer whitening now?

- To attract and retain patients with expanded service that differentiates your practice
- If you already have an ezlase laser, whitening will increase your ROI

Why use the ezlase Whitening System?

- *Faster in-office treatment* allows you to treat more patients in a day, and patients are happier to spend less time in the dental chair
- *Best whitening improvement* available
- A patient needs immediate results and might not have time for take home whitening (job interview, wedding, etc.)
- The ezlase laser can also be used for soft-tissue procedures and for some pain therapy (such as TMJ)

waterlase® dentistry

waterlase® dentistry

The most efficient teeth whitening system available



ezlase™ 940 nm Laser
ezlase™ Whitening Handpiece
LaserWhite20 Whitening Gel



waterlase® dentistry

LaserWhite20 Whitening Gel

- Proprietary gel, chromophore engineered and designed to work with Biolase diode laser systems
- Laser energy is absorbed by special particles in the gel to activate the H_2O_2 (38% concentration, after mixing with activator gel), accelerating the whitening procedure
- Desensitizer gel included to help reduce sensitivity if necessary
- Each kit good for one full-mouth whitening case



waterlase® dentistry

ezlase™ Diode Laser

- Three Systems in 1
 - Soft-Tissue procedures with minimal bleeding, swelling, or post-op pain
 - Teeth Whitening
 - Pain Therapy and Relief
- 940 nm or 810 nm wavelengths (whitening with 940 nm system)
- 7 Watts maximum output power for 940 nm
- Continuous Wave mode, or ComfortPulse™ settings for greater patient comfort with less anesthetic
- Battery pack for optimal operating convenience



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Comparison of Treatment Times

Product	Light Source	Treatment Cycle*
35% H_2O_2 Gel	[none]	60 min
BriteSmile	LED	90 min
NUPRO White Gold	[none]	60 min
Opalescence Xtra Boost	[none]	60 min
Sapphire	Plasma Arc	40 min
Zoom2™	Mercury Metal	60 min
LaserSmile	Diode Laser	40 min
ezlase 940 nm	Diode Laser	20 min

* Source: ADA Professional Product Review, Vol. 3, Issue 2, Spring 2008

** Used with the Zoom Advanced Power Light

- ezlase™ and LaserSmile are the **only** laser based whitening systems
- Other systems utilize light, but they do not use a laser

waterlase® dentistry

ezlase™ Whitening Handpiece

- Contoured to treat an entire quadrant of teeth at once, consistently, and comfortably
- Ergonomically designed to fit comfortably in your hand
- Elegant, small and extremely lightweight
- Proprietary handpiece design ensures safety to you and your patient

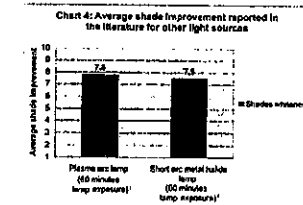
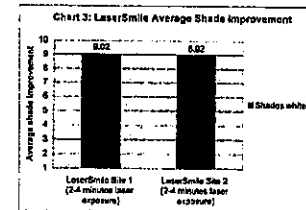


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In Early Clinical Trials

- St. Barnabas Hospital – Department of Dentistry (previously published LaserSmile Whitening System article in AACD)
- Various private practices in the US
- Goal: Demonstrate the efficacy of LaserWhite20 gel with the shorter improved clinical protocol
- Data collection expected at the end of Q2 2009

Comparison of Efficacy



Source of Charts: "LaserSmile Tooth-Whitening System: A Study by Two Independent Clinical Sites" from The Journal of Cosmetic Dentistry, Volume 19, Number 2, Summer 2003

- As the above charts show, LaserSmile provides approximately 9 shades of improvement, versus less than 8 shades of improvement from non-laser systems
- Biolase expects the ezlase Whitening System will deliver even better whitening results compared to the LaserSmile (see next slide)
- Nevertheless, dentists are encouraged to discuss predictability and efficacy with the patient prior to the start of the whitening process:
 - Results may vary depending on type of stain, enamel thickness, tooth structure, and age
 - Teeth with deep, intrinsic staining in the grayer tones generally will not respond as well as yellow shaded teeth
 - Some teeth are a natural yellow shade because enamel transparency allows the color of dentin to be visualized

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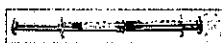
How to Use ezlase™ Whitening System

Note: Listed here is just a quick summary. Please carefully follow the Instructions for Use included with the LaserWhite20 gel and ezlase™ Whitening Handpiece.

1. Apply liquid dam to the gingiva, and cure with a standard curing light
2. Mix the activator and base gels by connecting the two syringes together and pushing the gels back and forth
3. Apply a thin layer of the mixed gel with a brushed applicator tip to each quadrant of teeth
4. Ensure that the doctor, patient, and all persons in the room wear protective eyewear before starting the laser
5. Place a disposable clear plastic cap over the whitening handpiece, and place the handpiece in close proximity (~ 1mm) to the first quadrant, without touching the gel



Liquid dam on gingiva



Mixing activator & base gels



Brushed applicator tip



Applying gel to teeth



Delivering laser energy



Removing gel from teeth

waterlase® dentistry

Laboratory Results on Hydroxyapatite Discs

Gel	Total Gel Contact Time	Laser Exposure Time	Approximate Improvement in Shade*
LaserWhite10	16.5 min	3 min	9
LaserWhite20	5 min	1 min	13

* Improvement in shade derived from "ΔE" measure, defined as a mathematical calculation of the "distance" between two colors on the CIE color space.

- LaserWhite20 is approximately 44% more effective than LaserWhite10
- LaserWhite20 takes approximately 1/3 of the time compared to LaserWhite10 on hydroxyapatite discs
[Note: Protocol recommends 9 min of gel contact time on teeth, but laser exposure time remains 1 min]
- Less laser exposure time reduces heating effects
- Note: Although these tests were not performed on teeth, enamel's primary material is hydroxyapatite (~95%)

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Ordering Information

ezlase™ 940 nm Laser

Biolase Part #: 7400001

Suggested US Retail Price: \$13,940

ezlase™ Whitening Handpiece

Biolase Part #: 7400022

Suggested US Retail Price: \$1,250

LaserWhite20 Whitening Gel

Biolase Part #: 7400030

Suggested US Retail Price: \$295 for a package of 5 kits

Includes: whitening base gel, activator gel, liquid dam, desensitizer gel, applicator & brushed applicator tips, syringe caps, disposable clear cap for Whitening Handpiece

ezlase™ Battery Pack

Biolase Part #: 7400024

Suggested US Retail Price: \$750

Delivers power for a typical day's worth of soft-tissue procedures plus 3 whitening procedures

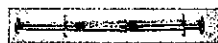
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How to Use ezlase™ Whitening System

6. Deliver 200 Joules of laser energy at 7 Watts to the quadrant (~30 seconds), and then repeat for all quadrants
7. Repeat step 6 one more time
8. Allow the gel to remain on the teeth for 5 more minutes, then remove with high-speed suction, and flush with an air and water spray
9. Replace the brushed applicator tip with a new one, and repeat Steps 3 through 8 one more time
10. Remove liquid dam



Liquid dam or gingiva



Mixing activator & base gels



Brushed applicator tip



Applying gel to teeth



Delivering laser energy



Removing gel from teeth

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EzLase Teeth Whitening with Whitening Handpiece

Laser System and Gel Compatibility

Laser System	LaserWhite20 Gel	LaserWhite10 Gel
ezlase™ 940 nm	✓	
LaserSmile		✓

- LaserWhite20 Gel will be compatible with LaserSmile by Q3 2009
- LaserWhite10 Gel is still compatible with the ezlase, but it is not recommended for optimal results

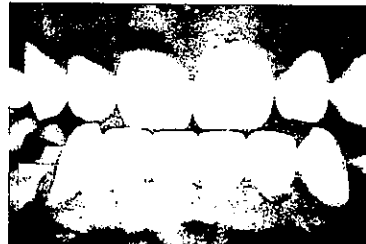
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Before
Laser Teeth Whitening



After
Laser Teeth Whitening

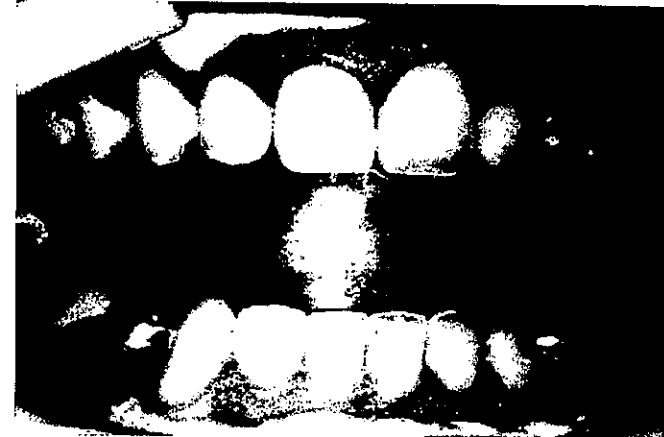


Maxillary Average: 7 shades lighter
C-1 to A-1

Mandibular Average: 6 shades lighter
C-2 to A-1

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Before Laser Teeth Whitening



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Laser Teeth Whitening Settings

- 7.00 Watts
- 200 J/ site (or approximately 30 sec.)
- Continuous Wave
- Application 1: 2 cycles
- Application 2: 2 cycles
- Allow gel to remain on teeth for a minimum of 5 min. after second laser cycle
- *1 cycle = 4 quads

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Laser Bleaching with Whitening Handpiece



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Laser Teeth Whitening Settings

- Whitening Handpiece
- 5.5 Watts
- Approx. 2 Watts/cm²
- Continuous Wave
- 2.84 cm², approx. 20 X the area of a bare fiber

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MWCLI, FACD, FICD**

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Granite City, IL 62040
Ph. (618) 931-2025
Fax (618) 931-8888
E-mail: chenlaser@gmail.com
Website: www.chenlaserinstitute.com**

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LLLT (Low Level Laser Therapy) with Whitening Handpiece

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**Biostimulation
with Whitening Handpiece**

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ezlase 940 nm

Therapeutic Indications

- FDA cleared indications
 - Temporary relief of minor muscle and joint pain and stiffness
 - Temporary relaxation of muscle
 - Temporary increase in local blood circulation
- Applicable Dental Procedures
 - TMJ Arthralgia (treatment of the Joint)
 - Myofacial Pain related to TMJ (treatment of the muscle related to painful trigger point)
 - Muscle relaxation related to pain and muscle stiffness after dental procedures or in general

Temporo-Mandibular Joint Dysfunction Affects Many People

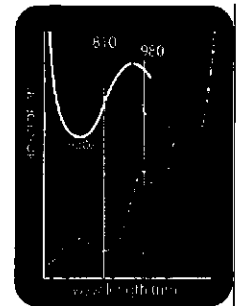
- 10.8 million people in the US suffer from TMD (NIH report); 90 % of this number are women
- Very complex origin – it is the only joint in the body that is associated with a psychological element as a very high correlation with stress.
- The condition is associated with pain in the joint that affects the mastication muscles. Pain can extend to the neck and the back.

Why compromise on your soft-tissue laser?



The Best Soft-Tissue Solution

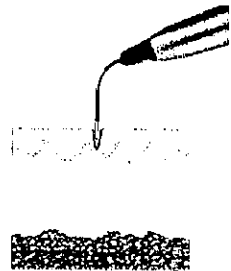
- 940 nm wavelength developed specifically for dental applications
 - Tissue does not have to be inflamed or pink to cut well (compared to 810 nm)
 - Great hemostasis due to position on the absorption peaks of Hb and HbO₂
- ComfortPulse™ provides efficient cutting and greater patient comfort
 - Short, high-power cutting pulses with longer intervals are used for tissue thermal relaxation
 - Hundreds of pulse combinations
- ezTips™ reduces chair time
 - Single-use, disposable tips can be changed in seconds
 - No more stripping and cleaving of tips
 - Diameters from 200-400µm, lengths from 4-14 mm
 - Bendable for various procedures



ezlase 940 nm

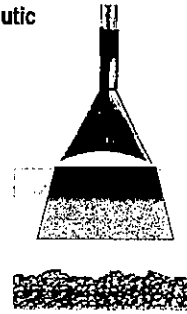
Surgical vs. Therapeutic Effects

Surgical



A concentrated beam of energy is delivered to tissue via a small diameter 200-400 μm fiber tip, and upon contact tissue is vaporized and removed.

Therapeutic



A diffused beam of energy size 35 x 8 mm is delivered to the tissue site over a period of time. The level of laser energy is low enough to have a therapeutic effect without any tissue destruction.

Temporo-Mandibular Joint Dysfunction Conventional Treatments

- Non surgical
 - Modified diet (soft food)
 - Cold/Hot Packs
 - Medication
 - Injection with Steroid
 - Occlusal mouth guards
- Surgical
 - Arthrolysis (washing of the joint)
 - Arthroscopy/arthroplasty (removing adhesions within the joint)
 - Discectomy/enectomy (joint replacement surgery)

ezlase 940 nm

Surgical vs. Therapeutic Use

Surgical



- Concentrated laser energy is applied to an outer layer of the fiber tip (absorber coating produced after tip initiation).
- **The Process – Absorption.**
- **The Effect –** Immediate tissue vaporization and removal.

Therapeutic

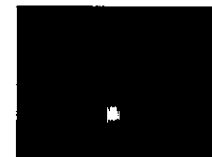


- Diffused laser energy is transmitted through tissue to treat. The image is of an ezlase beam transmitted through tissue as it was captured by an Infrared camera.
- **The Process –** Scattering (or Diffusion) through tissue.
- **The Effect –** Pain relief and improved functionality immediately post-treatment or over a few treatments.

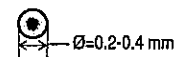
ezlase 940 nm

Surgical vs. Therapeutic Effects

Surgical

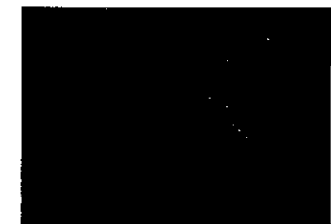


Surgical laser beam



Laser Treatment Beam Size:
0.13 cm^2

Therapeutic



therapeutic laser beam



Laser Treatment Beam Size :
2.8 cm^2
(x20 larger than surgical tip)

eZlase 940 nm

TMJ Clinical Protocol – Treatment Schedule Example

	SUN	MON	TUES	WED	THU	FRI	SAT
WEEK 1		Treatment 1		Treatment 2			
WEEK 2		Treatment 3		Treatment 4			
WEEK 3				Treatment 5			

eZlase 940 nm

Therapeutic Mechanisms of Action

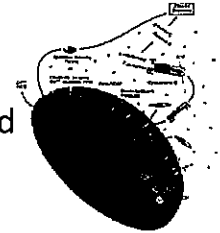
- Increased micro-circulation in tissue
- Photo-activation of inactive enzymes (catalysts) present in painful muscle cells



Swollen Cell

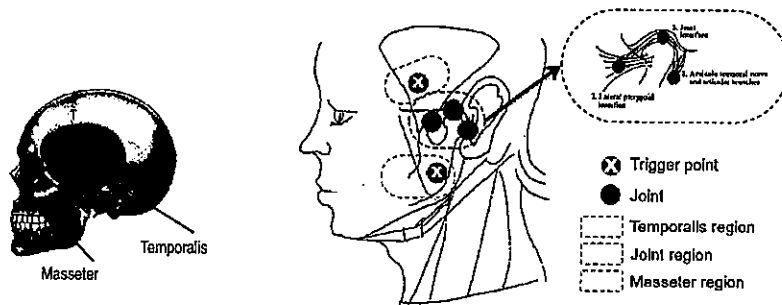
Normal Cell

- Improved cellular functions through increase of ATP (fuel for the cell) production in cells



eZlase 940 nm

TMJ Clinical Treatment Protocol



- Treatment of Painful Trigger Points (Myofascial Pain)
 - Palpate masseter and temporalis to identify painful trigger points; mark each point with a small dot and the covered area.
 - VAS Pain measurements for each point pre- and post-
- Treatment of the Joint (TMJ Arthralgia)
 - Treat the joint at the three locations provided in the image to the right

eZlase 940 nm

TMJ Clinical Protocol – Therapeutic Settings



- Laser Coverage Area = 2.80 cm² (35 x 8 mm)
- Exposure Time (t) = 1 min and up to 10 min

Method	Contact Mode	Power Setting (P)	Power Density
1	contact	2.0 - 2.5 W	0.71 - 0.89 W/cm ²
2	Contact/non-contact	4.0 - 4.5 W	1.43 - 1.61 W/cm ²
3	non-contact	5.0 - 5.5 W	1.79 - 1.96 W/cm ²

- Settings vary depending on the type of skin and patient response
- Start at the lowest recommended setting (power and exposure time), and increase as necessary
- Therapeutic energies applied to any muscle or joint are measured in "Dose of energy"
The formula to calculate the Dose is as follows: Dose [J] = P (W) x t (s)

Biostimulation



Teeth Whitening Handpiece

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ezlase 940 nm

Therapeutic Applications - Clinical Benefits

- Progressive/immediate relief of pain
- Reduction in muscle tenderness and stiffness
- Improved functionality of the affected
- Improve quality of life
- Gentle to tissue in comparison to other alternatives such as steroid injections, or appliances such as mouth guards

Biostimulation



28 mm



40 mm

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Photo MWHC MWHC MWHC

Biostimulation (LLLT)



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Photo MWHC MWHC MWHC

Limited Opening: 28mm

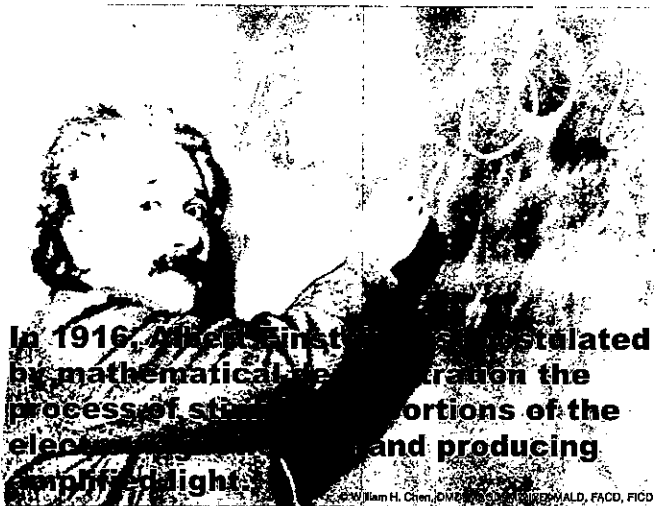
WILLIAM CHEN, BMD,
CD, MAJLTD,

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GAITHERSBURG, IL 62141
PR (618) 931-2025

17 Nov

Laser Physics, History, Safety and Regulations

William H. Chen, DMD, MAGD,
MALD, MWCLI FACD, FICD

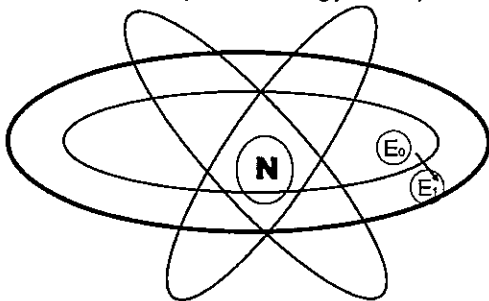


Laser Energy and Safety



BOHR'S MODEL

Electrons have separate energy levels, E_0 and E_1 .



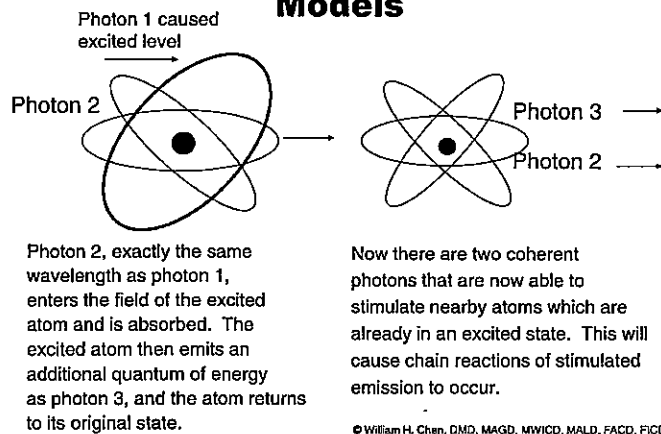
A quantum of energy can be gained or lost by the atom, and there will be movement from one level to another. The atom prefers the stable, normal state of E_0 .

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Light
Amplification
Stimulated
Emission of
Radiation

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Einstein's Stimulated Emission Models



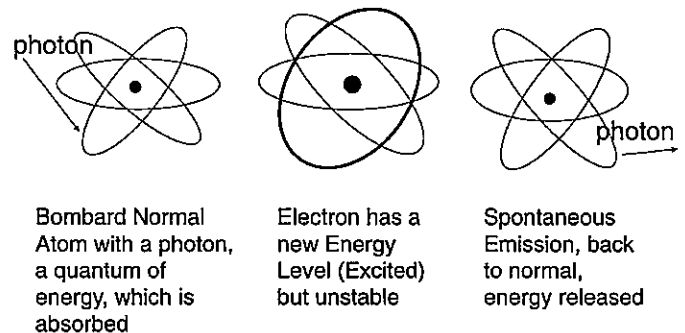
Spontaneous Emission

An atom absorbs energy and a new energy level is created. When the excited state decays to the lower energy state by emitting the excess energy as a photon or quantum of energy, it is defined as spontaneous emission.

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Bohr's Spontaneous Emission Models



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Lasers in Dentistry

- **Charles Townes developed the MASER – Microwave Amplification by Stimulated Emission of Radiation, in early 1950.**
- **In 1960, Theodore H. Maiman inserted a ruby rod into a photographic flash lamp, and the LASER was born. In 1964, Ralph Stern and Reidar Sognnaes used the ruby laser to vaporize enamel and dentin.**
- **In 1966 Leon Goldman used the laser clinically on enamel and dentin.**

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Stimulated Emission

An atom in the excited state absorbs another quantum of energy. As the excited state decays into a stable state, two coherent quanta are emitted, defined as stimulated emission.

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1990 – Nd:YAG

Myers and Myers given credit for getting the Nd:YAG lasers approved by FDA for intraoral soft tissue surgery. This is the first laser designed specifically for general dentistry.

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Synopsis of Laser History for Intraoral Applications

1991 – Argon

FDA approved this laser for curing of composite materials

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1970s – CO₂ Laser

First lasers to be marketed for intraoral use

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1995 – CO₂

FDA approved this laser for teeth whitening

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1970s and 1980s

**CO₂ laser used in surgery by specialists only:
ENT surgeons
Oral surgeons
Some Periodontists**

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1999 – Diode

(Twilite) – FDA approved this laser to perform a wide range of soft tissue procedures.

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1997 – Nd:YAG

FDA approved this laser for sulcular debridement

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2000 – HeNe

(Diagnodent) – FDA approved this laser for caries detection

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1997 – Er:YAG

FDA approved this laser for caries removal and cavity preparation

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2001 – Diode

(LaserSmile, Twilite) – FDA approved this laser for teeth whitening

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1998 – Er,Cr:YSGG

(Millennium) – FDA approved this laser for caries removal and cavity preparation, removal of coronal pulp and other soft tissue applications.

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2003 –Er,Cr:YSGG

(Waterlase) – FDA approved this wavelength for apicoectomy.

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2001 – Er,Cr:YSGG

(Waterlase) – FDA approved this laser for periodontal disease treatment

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2004 – Er,Cr:YSGG

(Waterlase) – FDA approved for Periodontal Surgery that includes gingivectomy, gingivoplasty, osseous recontouring, osseous resecting, etc.

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January 2002 –Er,Cr:YSGG

(Waterlase) – FDA approved this wavelength for endodontic applications

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2004

Waterlase MD is launched

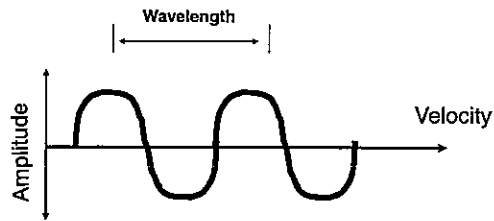
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February 2002 –Er,Cr:YSGG

(Waterlase) – FDA approved this wavelength for bone applications: cut, shave, contour and resectioning

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Electromagnetic Waves

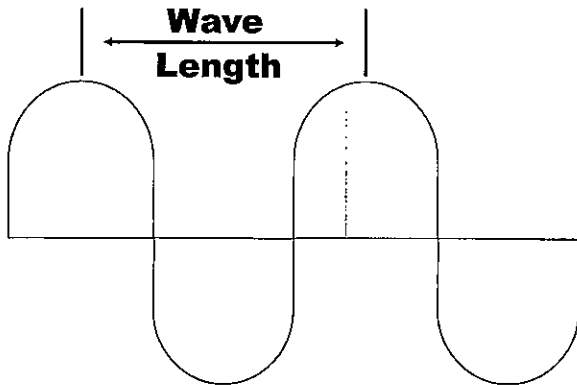


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2006 – 940 nm Diode

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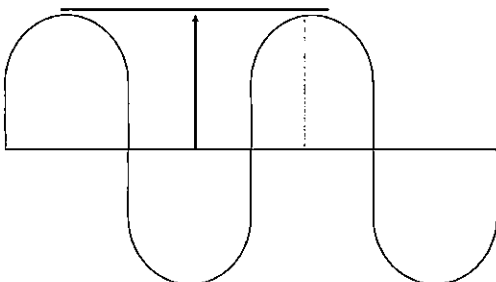
Wavelength-the distance between two corresponding points of successive waves.



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Laser Physics 101

Amplitude of a Wave-
total height of a wave from the top of
one peak to the bottom of the next.



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Electromagnetic Waves:

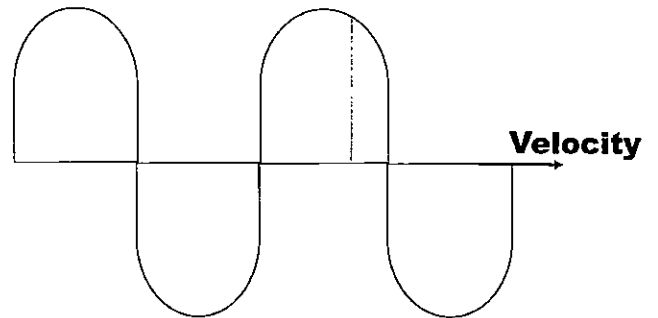
**time-varying electric and
magnetic fields propagating
through space.**

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Characteristics of Laser Light

1. Typically one color (monochromatic)
2. Highly focused and directional (collimated)
3. Organized, efficient (coherent energy)

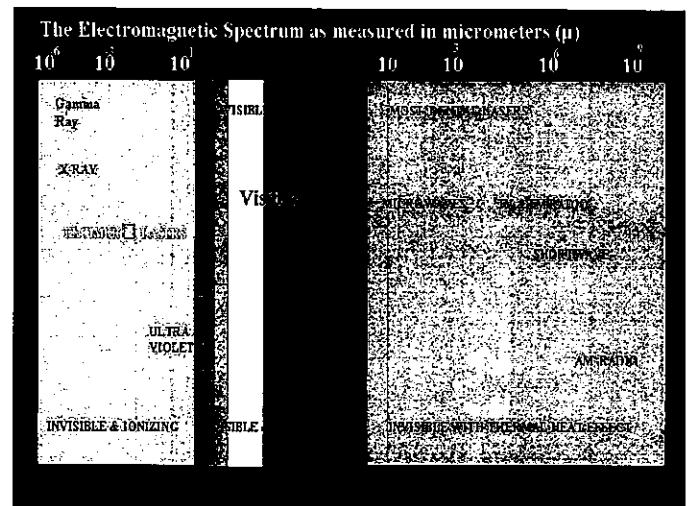
Velocity-
the speed at which a wave travels through space



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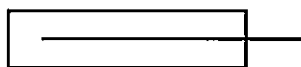
Characteristics of Ordinary Light

1. Many colors (polychromatic)
2. Not focused and in many directions (non-collimated)
3. Unorganized (incoherent energy)

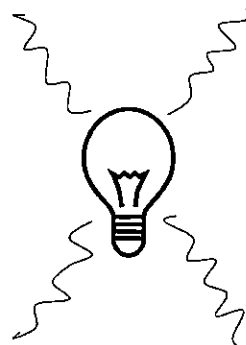


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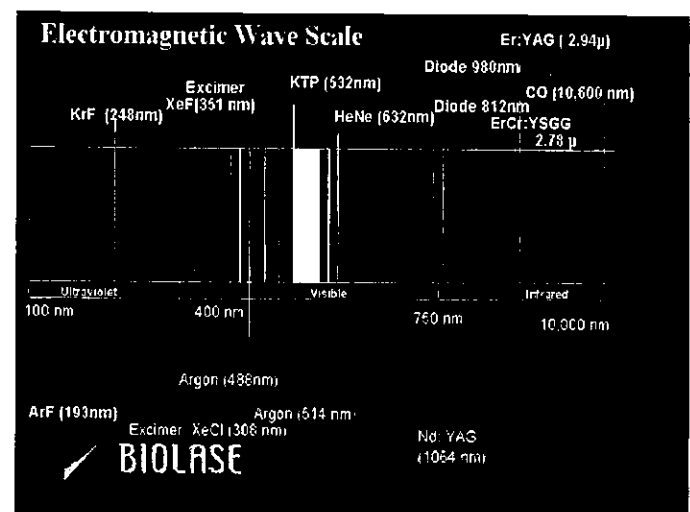
Laser Light



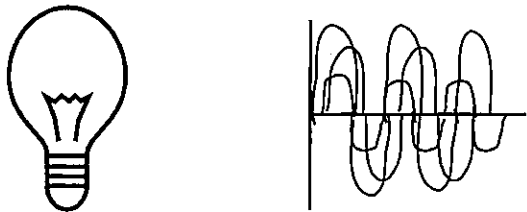
Ordinary Light



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Ordinary Light

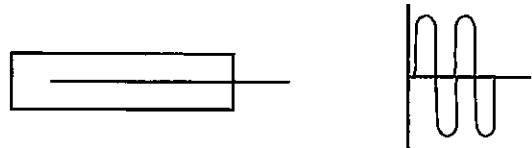


Non-coherent – energy waves travel randomly and are not in phase

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Laser Light

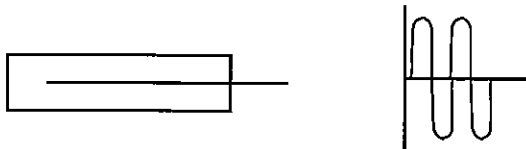
Monochromatic



All One Color

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Laser Light

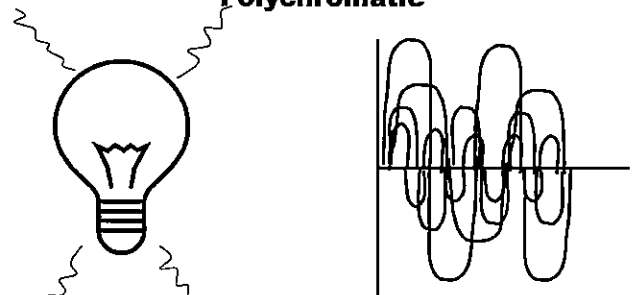


Collimated – energy travels as a bundle

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Ordinary Light

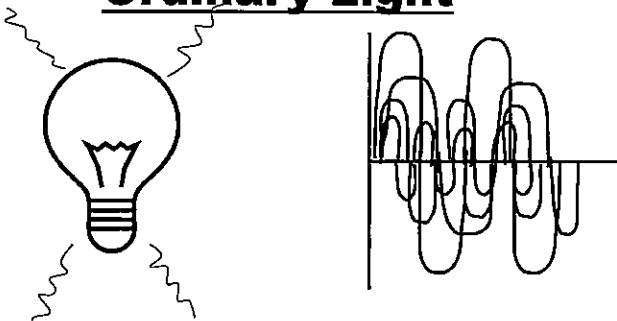
Polychromatic



Many Wavelengths and Colors

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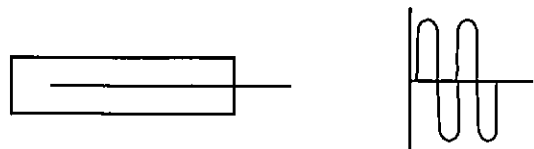
Ordinary Light



Non-collimated – energy travels in a multidirectional and random pattern

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Laser Light



Coherent – energy waves remain in the same phase

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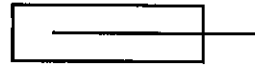
Active medium:

gas, solid, dye (flashlamp-pumped, Argon-pumped) or semiconductor suspended in an optical cavity

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Summary:

Laser Light



**monochromatic
coherent
collimated**

Ordinary Light



**polychromatic
incoherent
non-collimated**

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Power Supply:

external energy source that acts as a pumping mechanism to continuous stimulated emission (population inversion)

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What do you need to build a laser?

Optical Resonator:

mirrors for amplification

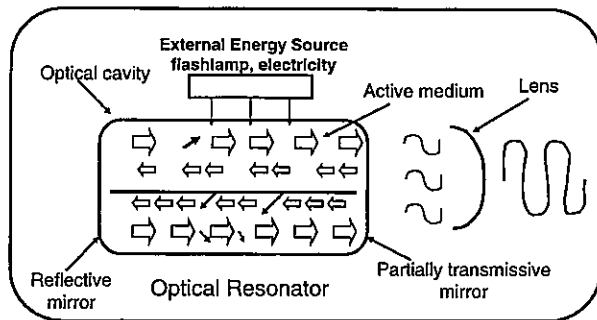
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You Need:

- **Active medium**
- **Power supply**
- **Optical resonator**
- **Cooling system**
- **Control system**
- **Delivery system**

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LASER COMPONENTS



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Cooling system:

water
air

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Delivery Systems:

Fixed mirror and lens system
Articulated arm
Hollow waveguide
Optic fiber

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Control System:

electronic

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Fixed Lens Mirrors:

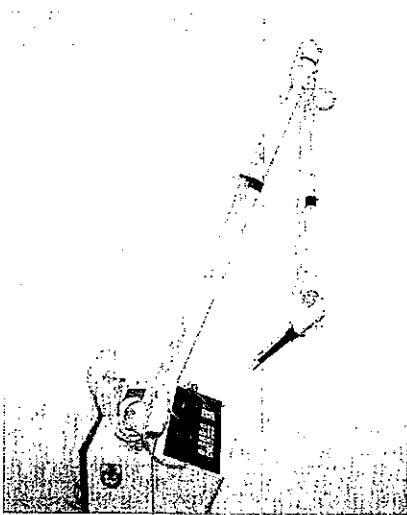
Oldest and least flexible system to transmit laser energy. Not used much in medicine and dentistry today.

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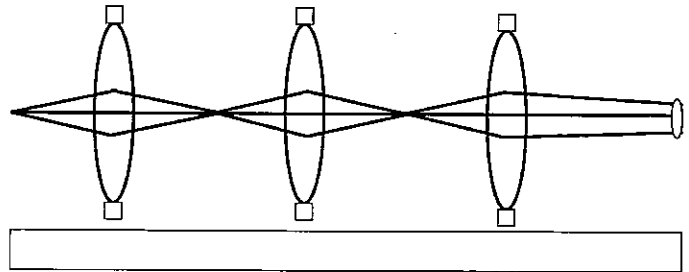
Delivery System:

most efficient by optic fiber

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FIXED MIRROR and LENS



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Hollow Waveguides:

A tubing with mirrored internal walls that allows the energy to be reflected through the tube. Changing position can affect power.

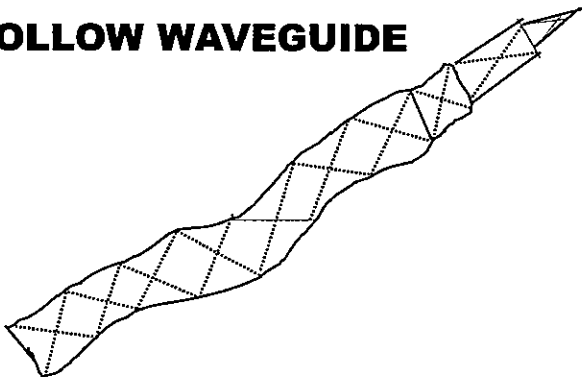
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Articulated Arms:

Uses mirrors to transmit energy through a series of “knuckles” when the wave length cannot be used with a fiber.

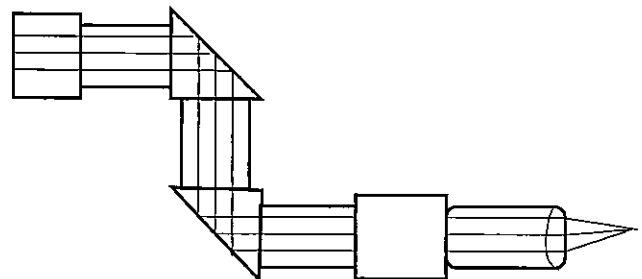
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HOLLOW WAVEGUIDE



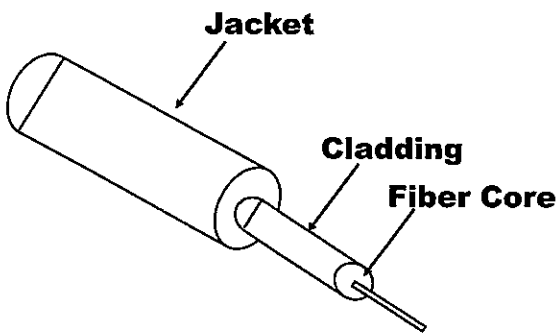
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ARTICULATED ARM

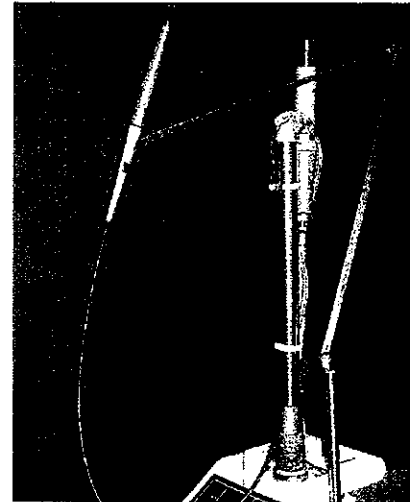


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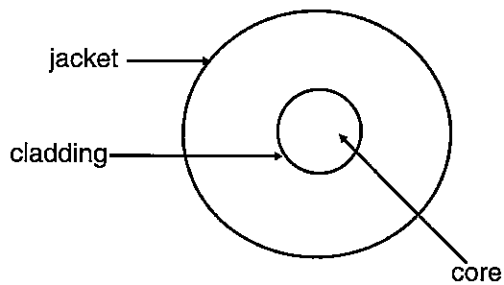
Components of a Fiber Optic



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OPTIC FIBER



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Fiber Optics:

Usually quartz, silica, sapphire, or a combination.

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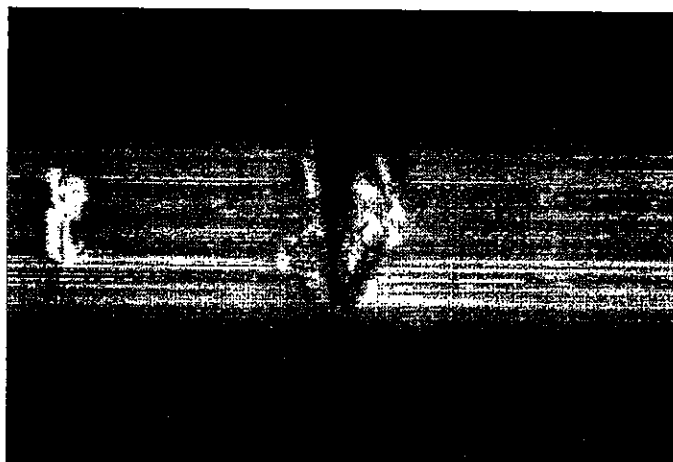
Optic Fiber of Diode and Nd:YAG

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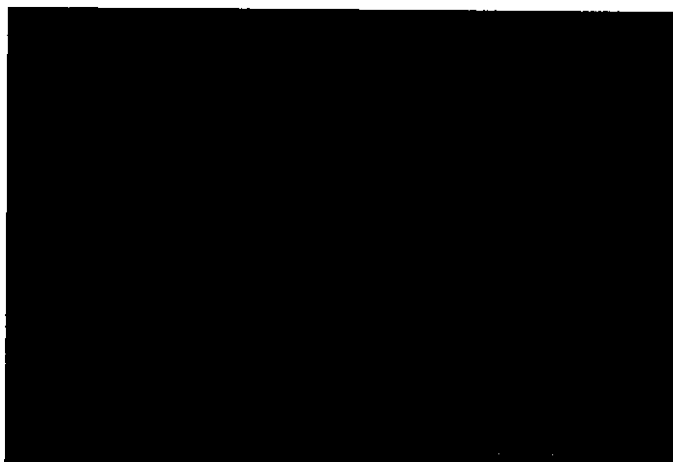




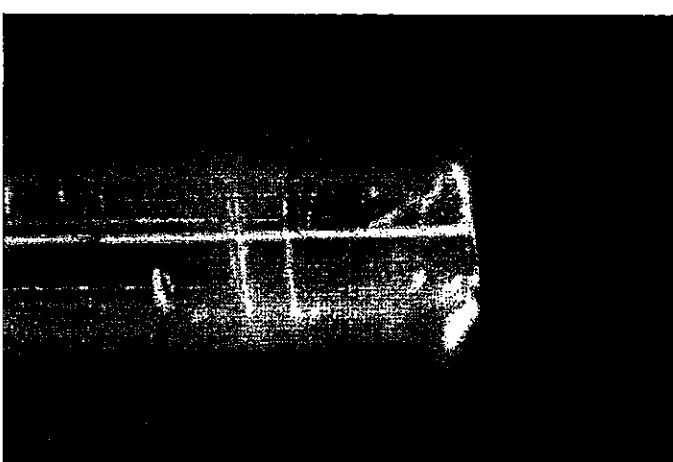
A poorly cleaved fiber



A scored notch in fiber, ready to be cleaved.



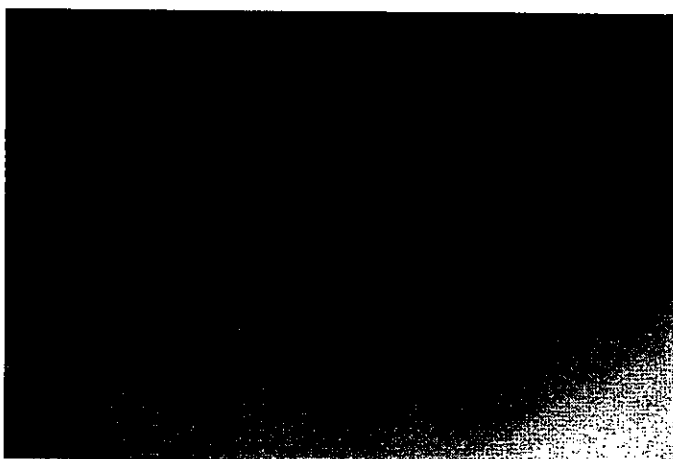
Aiming beam of a poorly cleaved fiber



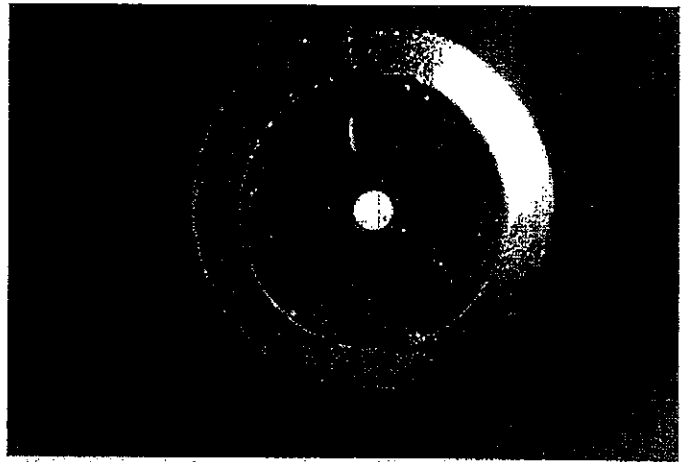
A well cleaved fiber end



Carbonized end of fiber, needs to be cleaved.



Aiming beam of a well-cleaved fiber



Clean connector end of optic fiber

Modes of Operation

- **Continuous Wave**
- **Gated Pulsed Mode**
- **Free-Running Pulsed Mode**

Federal and Local Regulations

Manufacturer has an obligation to report an adverse effect to the FDA.

FDA requires distributors to report death and serious injuries to the FDA and the manufacturer.

FDA requires that facilities using the device report to the FDA deaths and serious injuries to the manufacturer.

Individual private practices are encouraged to voluntarily report adverse events to the FDA and strongly recommend reporting adverse effects to the manufacturer.

Medical surveillance log is to be kept, and when an employer becomes injured, immediate medical attention is to be sought, and a report of the incident is to be kept for 30 years.

Laser Safety Officer Responsibilities Include:

1. Oversees the safety practice of the laser.
2. Responsible to do hazard identification and assessment within the operative setting.
3. Establishes the standard operating procedure for the laser.
4. Ensures proper laser safety training for all persons working within the environment.
5. Approves use of protective equipment, such as eyewear.
6. Specifies use of warning signs and labels.
7. Implements an emergency action plan and incident report mechanism.
8. Be current with laser safety protocols and attend CE to update knowledge and standards.
9. Keeper of the key to unlock the laser for use.
10. Keeps records of supplies, repair and medical surveillance log.
11. Provide for proper evacuation of plume and to make certain that there are no combustible gases in the area.
12. Make certain that the electrical cords and footswitches are working correctly and that the emergency safety are operational.
13. Test-fire the laser.

LASER TERMINOLOGY

Amplitude	The total height of a wave from the top of one peak to the bottom of the next
Articulated arm	A device that is used as a means of directing the laser beam; usually a series of hollow tubes with mirrors
Atom	The smallest particle of an element that can exist, either alone or in combination
Average power	Power on a sustained basis
Coherent	A property of electromagnetic waves in which every wave is of the same wavelength and precisely in phase with one another
Collimated	A property of electromagnetic waves in which all the waves are parallel
Continuous wave	A laser that continuously emits energy
CW	Abbreviation for Continuous Wave
Electromagnetic	An entire range of wavelengths or frequencies of the electromagnetic spectrum, extending from gamma to radio waves
Electromagnetic waves	Time varying electric and magnetic fields propagating through space. Light is a form of electromagnetic energy emitted as a photon traveling in waves
Energy	The ability to do work. The unit of energy is a Joule
Energy density	The amount of laser energy delivered to a given surface, measured in Joules/cm ²
Exposure time	The total period of time that tissue is exposed to laser energy
Fluence	A synonym for energy density, also measured in Joules/cm ²
Frequency	The number of complete oscillations per second of a wave

Hertz	Unit of Frequency in cycles per second
Joule	A unit of energy, abbreviated as J. When divided by 1000, it is known as a millijoule (mJ)
LASER	Acronym for Light Amplification by Stimulated Emission or Radiation. It is a device that uses the natural oscillations of atoms between energy levels for generating coherent electromagnetic radiation in the ultraviolet, visible, or infrared regions of the electromagnetic spectrum
Medium (active)	One or more gases, liquids, or solids used to produce amplified, stimulated emission in a laser
Micron	One millionth of a meter, used as a measure of wavelength. Abbreviated as 10^{-6} meter. Another term is micrometer.
Mode	A stable condition of oscillation in a laser. A laser can operate in one or more modes
Molecules	The smallest particle of a substance that retains the property of that substance, composed of one or more atoms
Monochromatic	A single wavelength of frequency (one “color”)
Nanometer	One billionth of a meter, used as a measure of wavelength. Abbreviated as 10^{-9} meter.
Output power	The power of a laser, expressed in Watts.
Peak power	The power level during a pulse from a free-running pulsed laser
Photon	A quantum of radiant energy. The basic particle of light
Population inversion	An energy distribution in which more electrons are in a higher energy state than in a lower one.
Power	The rate of doing work. The unit of power is a Watt.
Power density	Average power divided by the area of the laser beam.

Pulsed laser	<p>A laser that emits energy at timed intervals.</p> <ul style="list-style-type: none"> • A gated pulsed laser is a continuous wave emission that is physically shuttered on and off. The shortest pulse width is usually one one-thousandth second. • A free-running pulsed laser emission is produced electronically, and its pulse width is measured in microseconds.
Pulse width	The amount of time that the pulsed laser energy is emitted in each pulse, also known as pulse duration.
Quantum	A measurement of quantities of energy. Can be referred to as a Photon.
Radiant energy	Quantity of energy traveling through space in the form of light waves, measured in Joules.
Radiation	The process of emitting energy in the form of waves or particles.
Spontaneous emission	The emission of a photon by an electron when it spontaneously drops from a higher energy level to a lower, more stable, one.
Stimulated emission	The process that occurs when an electron in an excited state is further stimulated, absorbs an additional photon, and then drops to its lower and more stable energy level. Typically, the photon doing the stimulating was just emitted from an electron that had just made the same transition.
Velocity	The rate of speed at which a wave travels. The speed of light.
Watt	A unit of power. One Watt equals one Joule for one second.
Wavelength	The distance between two corresponding points in a periodic wave, measured in meters. For our purposes, our measurements are in microns, micrometers, or nanometers.

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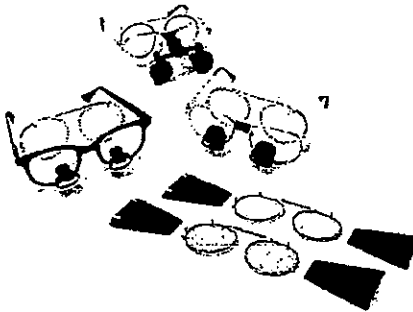


Innovative Optics Inc.

LASER CLIP-IN

Do you wear magnifying loupes when working with a laser? The patented Clip-In design is to be worn with magnifying loupes when working with a laser. A gold metal frame with four clips, a spring adjustable brow bar and opaque universal side shields make this a complete package. Available in 14 sizes.

Also available, X-RAY CLIP-IN



Each clip-in is designed to fit a specific size frame.

Innovative Optics Announces the New Custom Fit Laser Clip-In Loupes

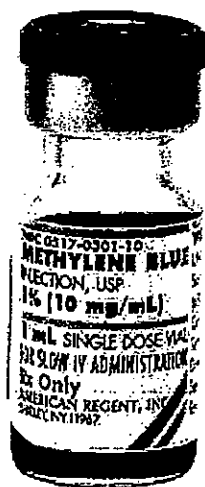
LASER TYPE	OPTICAL DENSITY	GLASS OR POLY LENS	MODEL #
Diode	O.D.5 @ 800-830nm	Glass	DIO
Multi Wave Length	O.D.5 @ 940/980/1064/2780-2940/10,600nm	Glass	MWL
YAG/ERBIUM	O.D.7 @ 1064/2780-2940nm	Glass	YGE

Innovative Optics distributes and manufactures laser safety, x-ray safety, and IPL safety eyewear for healthcare and Industrial protection.

INNOVATIVE OPTICS
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Methylene Blue Injection, USP



Product No. 0517-0301-10

Description 1% 10 mg/mL
(Preservative Free)

Supplied 1 mL Single Dose Vial

Shelf Pack 10

Wholesaler Numbers

AmerisourceBergen Item #: 558031

Cardinal Item #: 1426980

HD Smith Item #: 5170733

Mckesson Item #: 1733179

Morris Dickinson Item #: 079988

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TAC 20% Alternate Topical Anesthetic Gel

Tetracaine 4%, Phenylephrine 2%, Lidocaine 20%
TAC 20% Alternate – Peppermint Flavor

For Office Use. \$24.00 / 20 gm jar

Peppermint flavored topical anesthetic gel used to numb injection site for a painless experience or to provide pain free procedures without an injection. The combination of these two local anesthetics has profound anesthetic effect. Phenylephrine is a powerful postsynaptic alpha-receptor stimulant with little effect on the beta-receptors of the heart. Phenylephrine promotes local hemostasis to decrease systemic absorption and prolong duration of action.

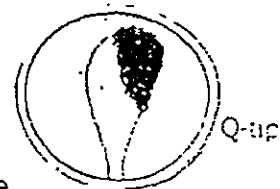
Available in a more viscous gel, request **THICK** (green in color).

TAC 20% May Be Used For The Following:

- Used Prior For A Painless Injection
- Extracting Loose Primary Teeth
- Laser And Soft Tissue Procedures
- Scaling And Root Planning Of Deep Perio Pockets
- Labial And Lingual Frenectomies
- Dry Socket Irrigation
- Suture Removal
- Gag Reflex
- Gingival Curettage
- Pre-Palatal Injections
- Impressions
- Intra-Oral Radiographs
- Easing Pain Of Ulcers Or Mouth Wounds During Dental Visit

Directions for Use:

1. **Dry mucosal area thoroughly.**
2. **Apply a very small amount** with Q-tip or micro-brush
to **dry mucosa**, leave in place 2 to 3 minutes before procedure.
3. Peak effect will occur within 6 minutes after initial application
and last a minimum of 25 to 30 minutes.



Please note if irritation occurs you are using too large of an amount or leaving the applicator on the area too long.



Whites Compounding Pharmacy

2551 Greenwood Rd., Suite 110
Shreveport, LA 71103

(318) 631-2005

PRESCRIPTION INFORMATION

Directions for Application of

Lidocaine/Tetracaine/Phenylephrine Solution

Medication

Lidocaine 10%/Tetracaine 4%/Phenylephrine 2% in Solution

Use

This medication is used as a topical anesthetic to prevent pain from lasers, injections and other medical procedures.

Side Effects

This product may cause local irritation at the site of administration. You may also experience a feeling of warmth or coolness. This is considered normal and does not indicate an allergic reaction. Side effects that may go away during treatment include skin paleness, loss of feeling, itching, redness, or swelling at the treated site. If they continue or are bothersome, check with your doctor. If you notice other effects not listed above, contact your doctor, nurse, or pharmacist.

Precautions

Do not use this medication if you are hypersensitive to tetracaine, lidocaine or any other anesthetics. Avoid getting this medicine in your eyes. If you get this in your eyes, rinse them with plenty of water. This medicine blocks pain and feeling to the skin, therefore be careful not to injure the treated skin by scratching or rubbing.

Directions

This medicine is usually applied at your doctor's office, hospital, or a clinic. However, it may also be applied at home shortly before a scheduled procedure. Your doctor will instruct you on the proper time to apply the medicine (usually one hour before the procedure). Apply this medicine in a thick layer at the site of the procedure. Rub medication in thoroughly and liberally. Your doctor may want you to wear SPECIALIZED CUSTOMIZED AND HARD-TO-FIND MEDICATIONS TO MEET SPECIFIC PATIENT NEEDS.

Lasers and Their Characteristics as Used in Dentistry

Alexandrite (Frequency-Doubled)	377 nm	Ultraviolet (Invisible)	Solid	Melanin, Hemoglobin, Calculus (13)	Optic Fiber	Pulsed	Lens	Cataract	Skin Burn, Pigment Darkening, Hyperpigmentation
Argon Ion	488 nm, 514.5 nm	Blue, Green	Gas	Camphorquinone (14), Xanthophyll (488 nm); Hemoglobin and Melanin (488 and 514.5 nm)	Optic Fiber	CW	Retina	Retinal Lesion	Skin Burn and Photosensitive Reactions
Helium-Neon	632 nm	Red	Gas	Melanin	Optic Fiber, Articulated Arm	CW	Retina	Retinal Lesion	Skin Burn and Photosensitive Reactions
Ruby	694.3 nm	Deep Red	Solid	Melanin	Lens System, Articulated Arm	CW and Pulsed	Retina	Retinal Lesion	Skin Burn and Photosensitive Reactions
Diode	812-980nm	Near Infrared (Invisible)	Solid	Melanin, Water, Hemoglobin (Weak)	Optic Fiber	CW and Pulsed	Lens and Retina	Cataract and Retinal Burn	Skin Burn
Neodymium:YAG and Neodymium:CGSGG	1.064 μ m, 1.061 μ m	Near Infrared (Invisible)	Solid	Melanin, Water, Dentin, Oxygenated Hemoglobin (Weak)	Optic Fiber	Pulsed or CW	Lens and Retina	Cataract and Retinal Burn	Skin Burn
Neodymium:YAP	1.34 μ m	Near Infrared (Invisible)	Solid	Melanin, Water, Dentin	Optic Fiber	Pulsed	Lens and Retina	Cataract and Retinal Burn	Skin Burn
Holmium:YAG	2.12 μ m	Near Infrared (Invisible)	Solid	Water, Dentin	Optic Fiber	Pulsed	Cornea, Aqueous and Lens	Corneal Burn, Aqueous Flare, and Cataract	Skin Burn
Erbium:YSCG and Erbium:YAG	2.79 μ m, 2.94 μ m	Near Infrared (Invisible)	Solid	Water, Hydroxyapatite (2.79 and 2.94 μ m); Collagen (2.94 μ m)	Articulated Arm, Optic Fiber	Pulsed	Cornea, Aqueous and Lens	Corneal Burn, Aqueous Flare, and Cataract	Skin Burn
Carbon Dioxide	9.3, 9.6 μ m	Mid-Infrared (Invisible)	Gas	Hydroxyapatite, Water	Lens System	Pulsed	Cornea	Corneal Burn	Skin Burn
Carbon Dioxide	10.6 μ m	Mid-Infrared (Invisible)	Gas	Water, Hydroxyapatite	Articulated Arm, Hollow Waveguide	CW or Pulsed	Cornea	Corneal Burn	Skin Burn

Abbreviations

ArF Argon Fluoride
CGSGG Chromium Cadolinium Scandium Gallium Garnet
KrF Krypton Fluoride

XeCl Xenon Chloride
YAG Yttrium Aluminum Garnet
YAP Yttrium Aluminum Perovskite
YSGG Yttrium Scandium Gallium Garnet

i-glasses™

HRV

HIGH RESOLUTION VIDEO HEADSET



The i-glasses HRV is a small, portable, high-resolution video monitor that will connect to common video sources. With twice the resolution of a traditional TV set, and weighing only seven ounces, the i-glasses HRV offers the ideal combination of price and performance for most any video application. Use it with your camcorder, VCR, or other video sources. Or, for even higher image quality, connect i-glasses HRV to a DVD player or even the video output of your computer or laptop using an S-Video input. For superb clarity and fantastic color depth, consider i-glasses HRV, where *seeing is believing!*

A Wide Range of Video Applications:

- Personal and Private Video Viewing
- Portable Video Entertainment
- Remote Video Input
- Portable Video Solutions
- Immersive Video Gaming
- Medical Monitors
- Trade Show Attractions
- Video Inspection Systems
- Video Surveillance Tool
- Video Gaming Accessory
- Outdoor Video Monitor Solution
- Notebook Computer S-Video Out Capability

Package Includes:

- i-glasses HRV Head Mounted Display
- AC Power Adaptor
- RCA (Composite) Cable
- S-Video Cable

Optional Accessories:

- i-glasses HRV Battery Charger
- i-glasses HRV Portable Battery

Specifications:

- Resolution: 800 x 600
- Field of View: 26 Degrees Diagonal
- Image Size: 70" at 13'
- Color Depth: 24 Bit Input
- IPD Adjustments: None Required
- Focus: 13' TBR
- Eye Relief: 25mm
- Exit Pupil: 17mmH x 6mmV
- Convergence: 7'10", 100% Overlap, TBR
- Refresh Rate: Flicker Free 120hz display rate
- Input Frequency: 50 or 60 Hz
- Audio: Full Stereo
- Weight: < 7 Ounces
- Adjusts to Fit all Individuals
- Power: Barrel Connector
- Power Supply: Power Cube
- Control Features: On / Off, Volume Control, OSD-Control
- HMD Cable Configuration: Audio: Red and White RCA connectors
- PAL/NTSC Composite or S-Video Input: Scaled to 800 x 600



i-O Display Systems

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